WATTLE RESEARCH INSTITUTE
11 JUN 1956
UNIVERSITY OF NATAL, P.M.B.

AGRICULTURAL *Chemicals*

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Fertilizer Manganese in Soils
Aerial Spraying
Atomic Energy in Agriculture
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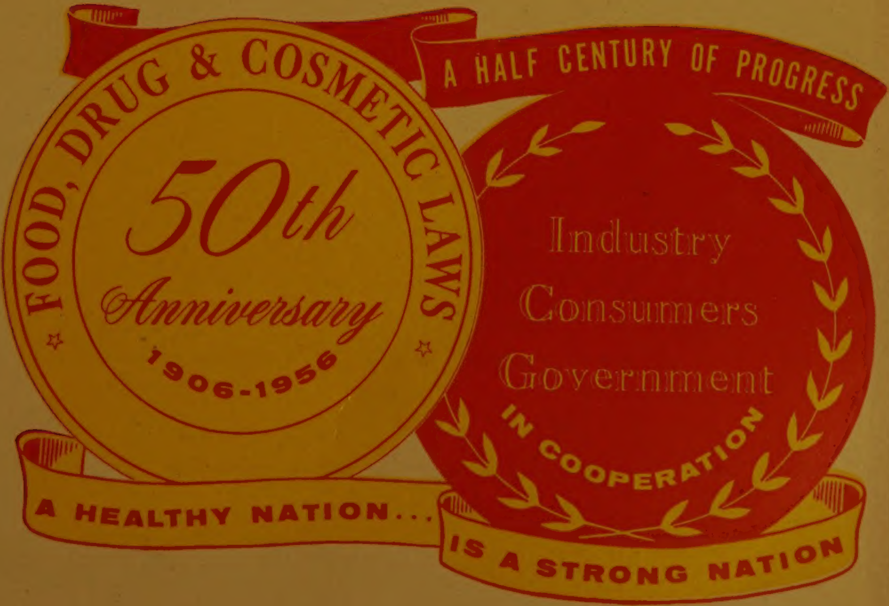
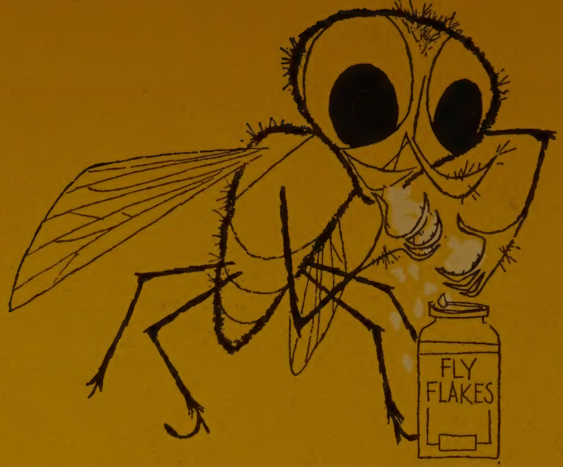


Anniversary Seal — Federal Food, Drug & Cosmetic Laws

May, 1956



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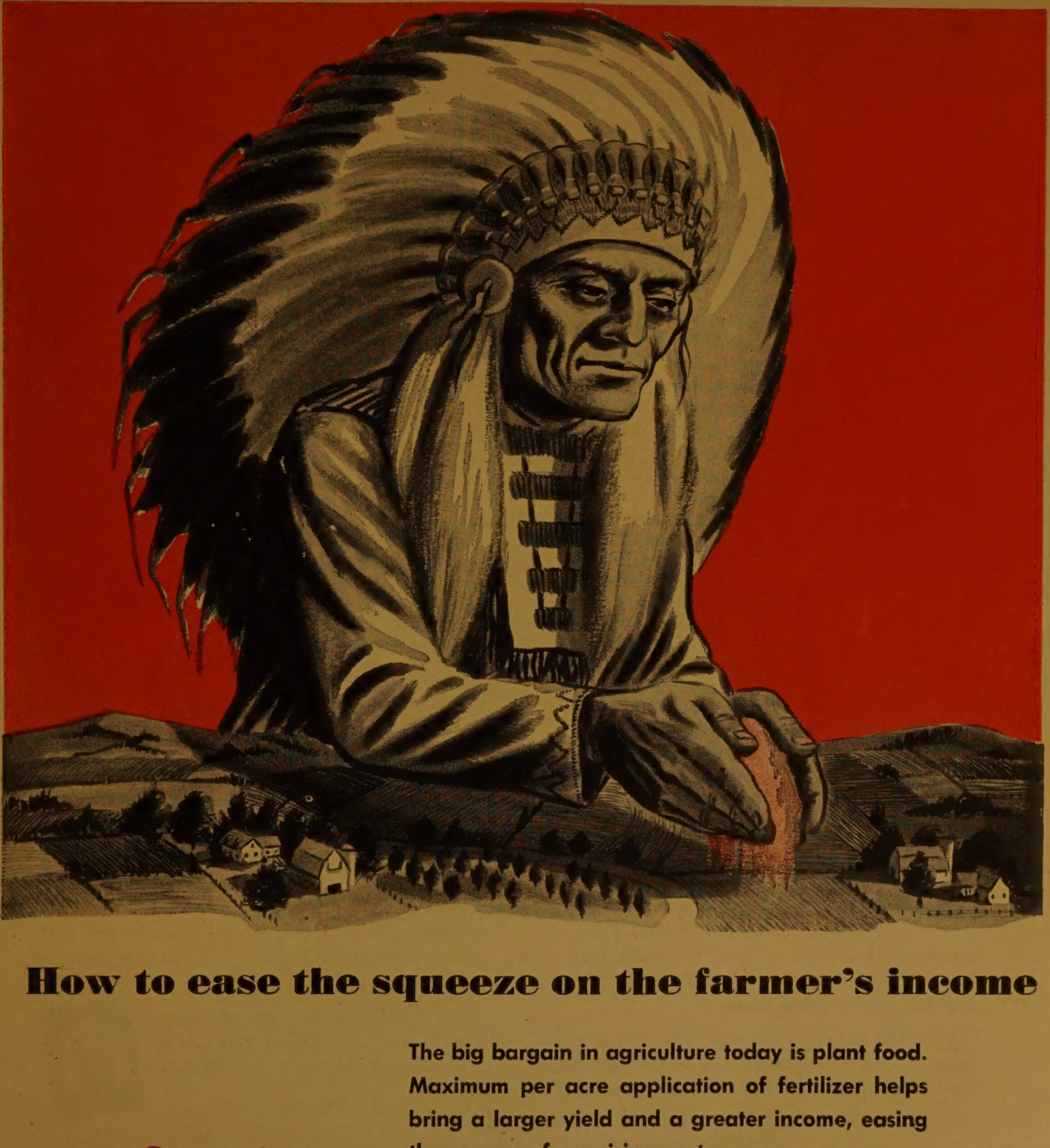

How to ease the squeeze on the farmer's income

The big bargain in agriculture today is plant food. Maximum per acre application of fertilizer helps bring a larger yield and a greater income, easing the squeeze from rising costs.

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. . . that does it!"

This spider mite might have surmounted a lesser obstacle. Now it is done. But the future for formulators and users looks all the brighter.

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AGRICULTURAL Chemicals

Anniversary seal in observance of the 50th anniversary of the Federal Food, Drug and Cosmetic Laws. The Association of Federal Food and Drug Officials of the United States will hold the anniversary celebration June 27, 1956 at the Mayflower Hotel, Washington, D. C.

Vol. 11, No. 5 May, 1956

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In the Spotlight this Month

A New Rodenticide . . . Effective control of rats and mice infestations obtained with "Fumarin," a new anticoagulant type rodenticide. Page 30.

New Defoliant . . . Phillips Petroleum reports very favorable combined defoliating and dessicating effects on cotton leaves with its new di(ethylxanthogen) trisulfide defoliant. Page 32.

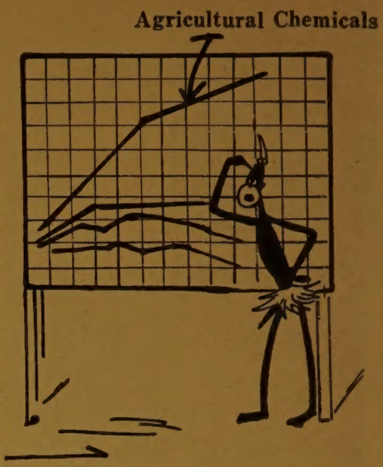
Manganese Fixation . . . An observation of the effect of soil acidity suggests that manganese deficiency can be reduced or even prevented if the pH is lowered, as for example, by the application of a suitable fertilizer. Page 35.

A French Report . . . on manganese deficiencies indicated that dusting crop foliage with manganese salts is more effective than incorporating manganese in the soil. Page 42.

Aerial Spraying . . . Jack Kenealy discusses the various factors considered, and community reaction to a decision to undertake aerial spraying of a residential community in Montgomery County, Pa., to control Cankerworm. The project resulted in 90% control, and only a minimum of complaints. Page 37.

Sugarcane Borer Control . . . Recent studies in use of 100% ryania to control sugarcane borer indicate promising results, meriting further investigation. Page 48.

Agricultural Chemicals . . . Development of one successful agricultural chemical costs research $1,200,000,—a cost at which no company can remain in the field if it cannot so plan and execute its merchandising that it will not only recapture its investment but also obtain the rewards in profits that justify the risk. Page 44.



Puzzled?

You may be puzzled about what the stock market will do . . . but there can be no question about what magazine to read.

Agricultural Chemicals offers you some 60 editorial pages each month, devoted to the technical and practical developments of the agricultural chemicals industry . . . a balanced distribution of articles and news of interest to the manufacturer and distributor of insecticides, fertilizers, herbicides, etc.

A technically trained staff is at YOUR service to edit, and interpret the information YOU are interested in—news, feature articles, meeting reports.

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If you are faced with the problem of making a profit out of growing your cash crops on fewer acres this year—fertilizer is the best help you can get! If you are taking part of your land out of production and planting this to soil-building crops that prevent erosion and build humus and fertility in the soil for future use—fertilizer is the best help you can get!

Fertilizer Grows Farm Profits

"Fertilizer is a real friend!"

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WE ARE ADVERTISING TO HELP YOU SELL MORE FERTILIZER

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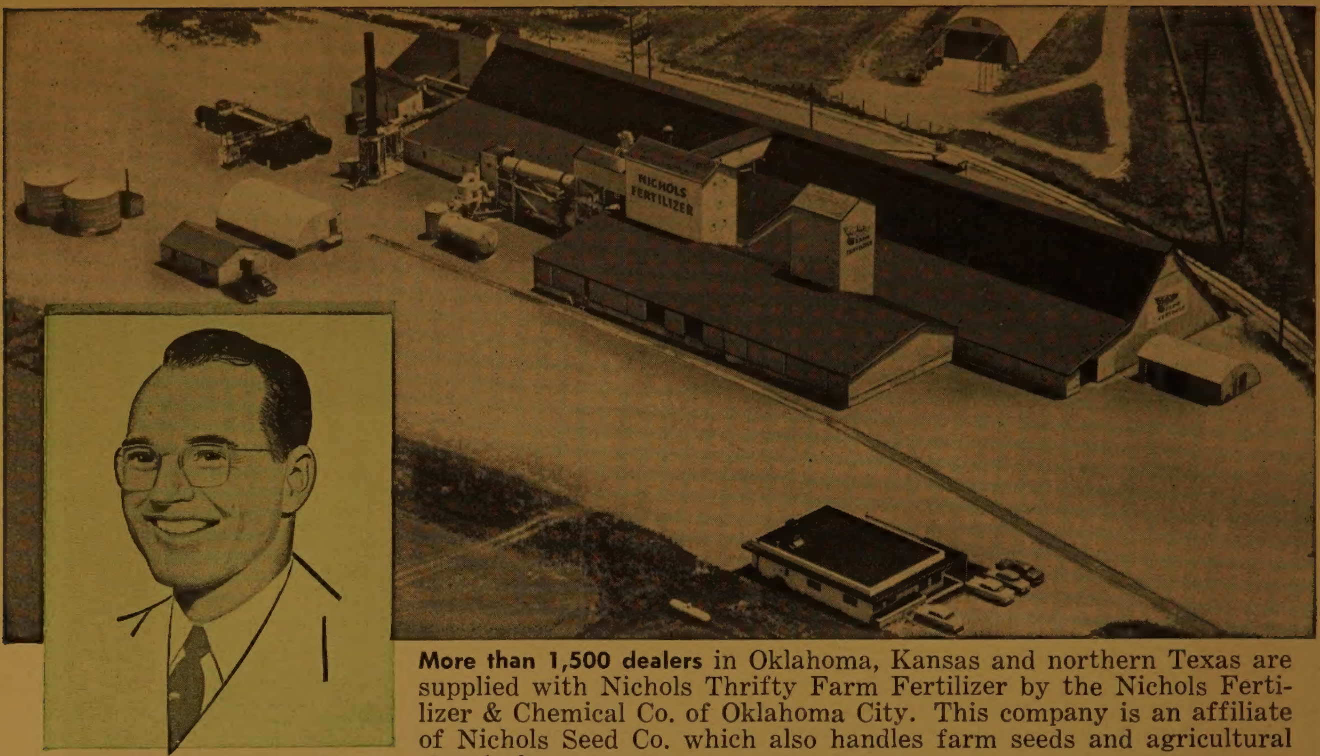
ANHYDROUS AMMONIA • UREA PRODUCTS • A-N-L® • A-N-S • SULPHATE OF AMMONIA

*Trade-mark



More than 1,500 dealers in Oklahoma, Kansas and northern Texas are supplied with Nichols Thrifty Farm Fertilizer by the Nichols Fertilizer & Chemical Co. of Oklahoma City. This company is an affiliate of Nichols Seed Co. which also handles farm seeds and agricultural chemicals.

Earl B. Nichols is president of Nichols Fertilizer & Chemical Co., Oklahoma City.

Nichols Fertilizer & Chemical Co.

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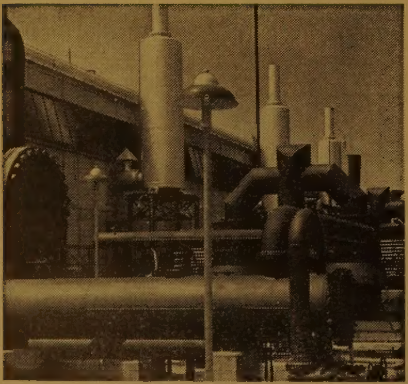

Here is some of the modern equipment used by Spencer to produce SPENSOL Nitrogen Solutions for some of America's leading fertilizer mixers.

On time deliveries of SPENSOL solutions have helped to build Spencer's reputation for dependable service to mixers throughout the country.

Spencer agronomists are there! Spencer's team of experienced agronomists is constantly at work helping to educate your present and future customers.

Mr. N

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SPENCER CHEMICAL COMPANY, Dwight Bldg., Kansas City 5, Mo. District Sales Offices: Atlanta, Ga.; Chicago, Ill.; Memphis, Tenn.; Works: Pittsburg, Kans.; Henderson, Ky.; Chicago, Ill.; Vicksburg, Miss.; Orange, Texas.

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DIAMOND ALKALI CHEMICALS

Diamond Chemicals

Insecticide formulators choose DIAMOND DDT·LINDANE·BHC for dependable potency

Formulators have come to depend on DIAMOND agricultural chemicals and one reason is the building pictured below. It's DIAMOND's research and development center, where the search for new and better insecticides is continually being pushed forward.

At other laboratories, located right at each DIAMOND plant, we check on every production step. This dependable *Quality Control System* is another reason for the uniform high quality of DIAMOND agricultural chemicals.

Write for helpful literature on any of our products, and feel free to use our technical consulting service for your special problems. Your inquiries are welcome. DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

DIAMOND INSECTICIDES

- DDT—Technical
- BHC—High Gamma and 14% Technical
- LINDANE—100% Gamma Isomer
- K-101 (Ovex) Acaricide
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Wettable powders; dust concentrates; and emulsifiable and oil solutions of our technical grade chemicals.

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- IMPROVED PHYSICAL CONDITION

DUVAL SULPHUR and POTASH CO.

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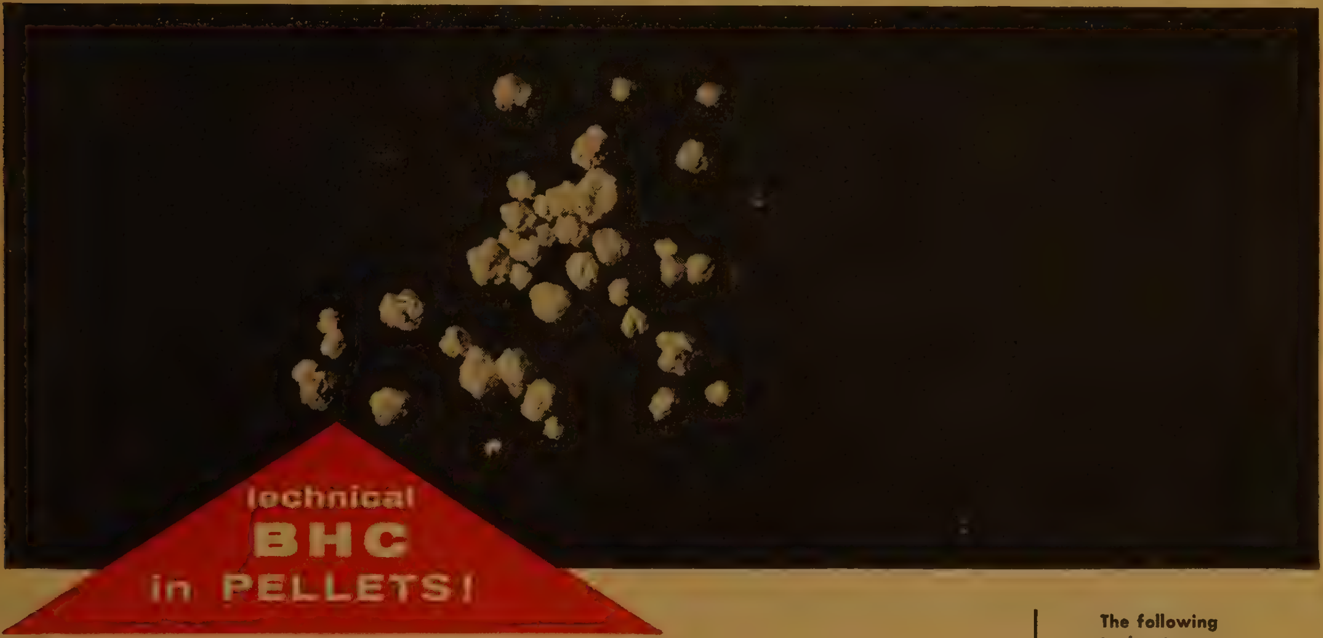
Stauffer Dust Bases are Production-tested for every factor that affects the Formulator's Profits

Every Stauffer Dust Base is prepared for the formulator's use. None is offered to the market until rigid tests have *proved* that diluents and other inerts are compatible with the widest range of toxicants . . . that they will not inhibit toxicant action . . . that they contribute to shelf life and efficiency . . . that they will not abrade equipment.

Stauffer plants and offices provide scientific and practical service geared to the needs of growers and formulators throughout the year.



. . . is the newest Stauffer product for formulators. It is made specifically to solve the grinding problems common to other BHC concentrates. These new pellets grind down easily without gumming or sticking. They improve your production throughput and product quality. Stauffer pelletized BHC is the only 24-gamma technical material. Regular 40-gamma technical and BHC Dust Bases are available.

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- BHC
- Chlordane
- DDD • DDT
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- Ovex
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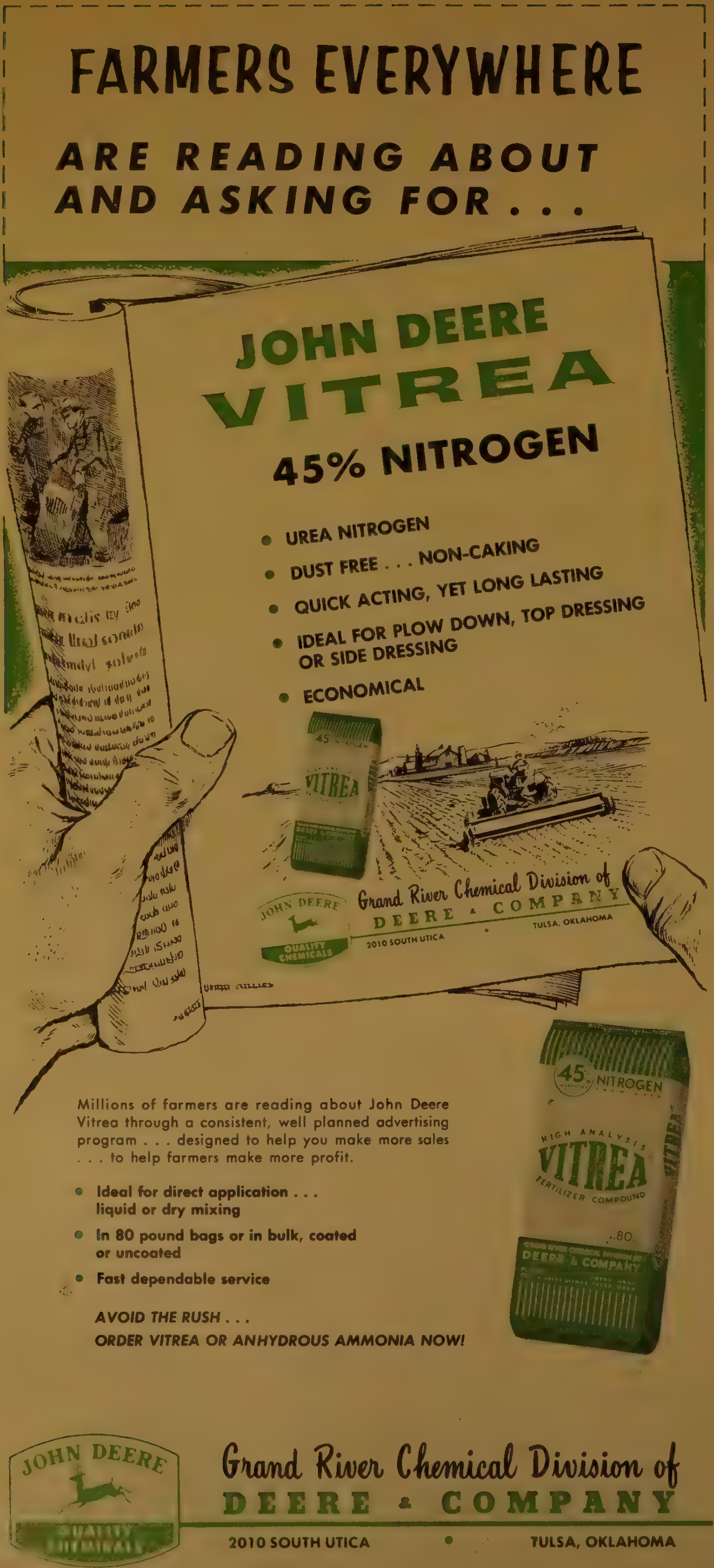

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ARE READING ABOUT AND ASKING FOR . . .

JOHN DEERE
VITREA
45% NITROGEN

- UREA NITROGEN
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- IDEAL FOR PLOW DOWN, TOP DRESSING OR SIDE DRESSING
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- Ideal for direct application . . . liquid or dry mixing
- In 80 pound bags or in bulk, coated or uncoated
- Fast dependable service

AVOID THE RUSH . . .
ORDER VITREA OR ANHYDROUS AMMONIA NOW!

Grand River Chemical Division of
DEERE & COMPANY
2010 SOUTH UTICA • TULSA, OKLAHOMA

MEETING CALENDAR

May 7-9—Carolinas Virginia Pesticide Formulators Association, Inc., Ocean Forest Hotel, Myrtle Beach, S. C.

May 10-11 — Governor's Safety and Health Conference; Sub-committee, Chemical Fertilizer Section, Lord Baltimore Hotel, Baltimore.

May 15 — Western Agricultural Chemicals Association, Spring Meeting, at Hotel Clark, Los Angeles.

May 20-22 — Chemical Specialties Manufacturers Association, Hotel Drake, Chicago.

May 28-30 — Chemical Institute of Canada, 39th Conference & Exhibition, Sheraton-Mount Royal Hotel, Montreal.

June 5-6 — North Central Division of the American Phytopathological Society, Kansas State College, Manhattan, Kans.

June 10-13 — National Plant Food Institute. The Greenbrier, White Sulphur Springs, West Virginia.

June 20-22 — American Society of Agronomy, Northeast Branch, Summer Meeting, University of Maryland, College Park, Md.

June 26-28 — Entomological Society of America, Pacific Branch, Hotel Claremont, Berkeley, Cal.

June 28-30—Association of Southern Feed & Fertilizer Control Officials, Hotel Roanoke, Roanoke, Va.

June 30 — Del Mar Va Peninsula Fertilizer Association, annual convention, Ocean City, Md.

July 12 — Annual South Carolina Fertilizer meeting and tour of the Edisto, Experiment Station, Blackville, S. C.

August 1—Kentucky Fertilizer Conference, Guignol Theatre, Univ. of Kentucky, Lexington.

August 14-15 — Ohio Agricultural Pesticide Meeting, Ohio Agricultural Experiment Station, Wooster, Ohio.

August 17-25 — 10th International Congress of Entomology, McGill University and University of Montreal, Ottawa, Canada.

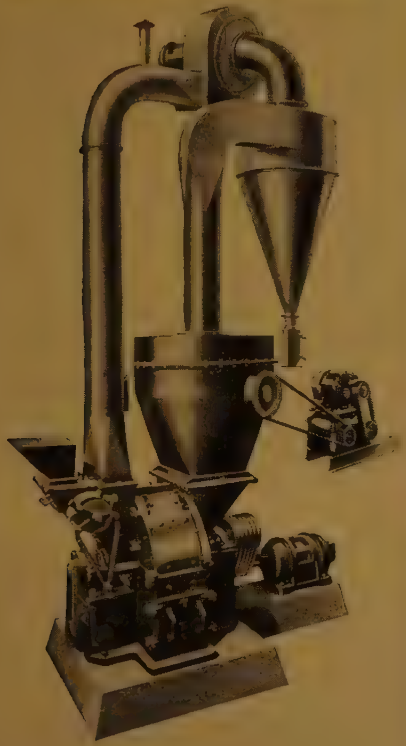
Nov. 19-20 — Entomological Society of America, Eastern Branch, Hotel Haddon Hall, Atlantic City, N. J.

Dec. 27-31 — Entomological Society of America, national meeting, Hotel New Yorker, New York City.

UNIFORM INSECTICIDES

Produced by Raymond clean, dustless, automatic, pulverizing units including Blended Field Strength Products also High and Low Concentrate Formulations

HELICOPTER METHOD OF LOW LEVEL DUSTING WITH "DDT" FOR CROP INSECT CONTROL



WHIZZER-EQUIPPED IMP MILL

A compact unit requiring minimum floor space. Well adapted for making field strength products and lower concentrate formulations.

THE Raymond system of pulverizing with *whizzer air separation* offers important production advantages.

•

You can make the field strength insecticides directly from the organic technical material and obtain an intimately blended mixture with commonly used diluents in one continuous process.

•

A simple exterior adjustment of the *whizzer separator* provides instant fineness control over a wide range. Consistent uniformity of product and maximum capacities are assured.

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Raymond installations are flexible in arrangement and easy to fit into your existing plant layout. Refer your problems and requirements to Raymond engineers.

Write for Raymond Bulletin No. 68 for complete details.

WHIZZER-EQUIPPED ROLLER MILL

An all-purpose, large capacity mill for preparation of all types of insecticide dust formulations including high concentrate mixtures.

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In just one year... over ¼ million tons have switched

Round-the-clock production at Bonnie takes the push out of peak-season demands. Mammoth off-season storage capacity swallows up the seven-day-a-week production, stores it safely until you need it. And the industry's finest delivery schedules assure you high-quality triple when you need it.

International's natural curing helps you cut costs

• It's the natural curing process that gives you that "something-extra" quality of the triple super from Bonnie.

It helps you cut costs . . . gives you better control of manufacturing conditions and chemical reactions . . . stabilizes your formulation problems . . . and reduces the delivered unit cost of (P_2O_5). Here's what natural curing means to you:

Uniform particle size . . . for dependable ammoniation results.

Finer texture . . . for more complete ammoniation in every batch.

Stabilized product . . . for better chemical control.

Constant high analysis . . . with guaranteed minimum of 46% A.P.A.

Uniform high quality . . . for increased (P_2O_5) availability.

To guarantee this top quality triple from a plant as large as Bonnie required extra planning in plant design . . . extra capacity for a dependable supply . . . extra time to complete the five-week natural curing process . . . and extra care and quality control to assure uniform results in batch after batch.

This is the way Bonnie was built. And the results of the past year have proved Bonnie can deliver . . . Bonnie is dependable . . . and Bonnie can produce the kind of triple you want.

# of Triple Super Sales to Bonnie

The reason: *trustworthy service and delivery plus superior results with International's natural-cured triple*

Yes, in a single year, International has zoomed to a top position as a supplier in the triple super industry. Here's why, in the actual words of Bonnie customers:*

Others have recommended you

"Several nitrogen producers have recommended your product to us because of its excellent ammoniation. They were right."

Missouri

You live up to delivery promises

"What we like about doing business with International is your service, particularly regarding delivery. Our material has always been shipped when requested."

Indiana

Your triple stores better

"Last September, we stored some of your triple next to competitive materials from two other suppliers. Six months later, the other two piles were set up hard enough to be blasted. Any lumps in your product could be broken with your fingers."

Minnesota

Your triple is a better product

"This is the best triple we have ever used for ammoniation."

Ontario

We get better ammoniation results

"We can put 600 lbs. of Urana 10 in with 1,400 lbs. of triple."

New York

Your Triple holds more nitrogen

"We have been amazed with the results. With a very high humidity we have been using 500 lbs. of nitrogen solution with 1,400 lbs. of your triple. Never before have we been able to get over 360 lbs. of this solution in the mix."

Maine

We save money with your triple

"We like the constant high analysis of your product. It aids us in formulation and reduces the unit delivered cost."

North Dakota

You meet delivery schedules

"We certainly appreciate the way International came through on schedule during the rush season."

Arkansas

**names on request*

These are just a few of the reasons why this year, the big switch in triple super sales is to Bonnie — giant production facilities . . . prompt delivery . . . superior quality . . . and outstanding ammoniation results.

So this year, for a better product, and service you can depend upon, look to International Minerals & Chemical Corporation. You'll be glad you did.

This 85,000-ton curing unit — as big as two, full-sized football fields — is one example of the time and big capacity needed to produce natural-cured triple.

These "doodads" and dials get results . . . guard the uniformity and quality of every batch of triple super from Bonnie . . . help assure you of top results in ammoniation.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Phosphate Chemicals Division • General Offices: 20 North Wacker Drive, Chicago 6

LIQUID FERTILIZER FORMULATORS: Join with this famous trade-mark and expand sales of YOUR BRAND with the first big liquid mixed fertilizer promotion to the farmer

MONSANTO

PHOSPHATIC FERTILIZER SOLUTION

Monsanto will help you sell your brand

Starting this spring Monsanto is sponsoring the first nationwide promotion to sell farmers on the advantages of liquid mixed fertilizers, and on the help and service farmers can get from you, and how Monsanto's phosphatic fertilizer solution improves liquid fertilizer performance.

Tops for phosphorus: Monsanto's phosphatic fertilizer solution

Monsanto's phosphatic fertilizer solution is made by the electric furnace process and is of such quality that it eliminates equipment clogging. It lets you make complete liquid fertilizers at competitive prices.

Expand the liquid fertilizer market with Monsanto

For formulators operating within a limited market area there's extra advertising value in joining with nationally known Monsanto in this liquid fertilizer promotion. To help you get full benefit Monsanto supplies free the merchandising and advertising aids described in the box at right.

Profits are waiting—send for details today

For easier, better formulating—for improved fertilizer solutions—for more sales and bigger profits: share in this big promotion. Write today for leaflet "Details of Liquid Fertilizer Promotion": MONSANTO CHEMICAL COMPANY, Inorganic Chemicals Division, Dept. A. C., 710 North Twelfth Blvd., St. Louis 1, Missouri.

FREE! TO USERS OF MONSANTO PHOSPHATIC FERTILIZER SOLUTION —THESE SELLING AIDS:

- Direct mail leaflets (ready for your own imprint)
- Hard-selling ad mats (with space for your name)
- TV and radio scripts
- All-weather road signs
- Truck and equipment decals
- Liquid fertilizer booklets (for your prospects)
- Big farm paper ad campaign by Monsanto (to help you sell)

Write for "*Details of Liquid Fertilizer Promotion,*" which gives you all the information.

MONSANTO CHEMICAL COMPANY,
Inorganic Chemicals Division, Dept. A. C.,
710 North Twelfth Boulevard, St. Louis 1, Missouri.

MONSANTO

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With The *Kraftpacker* Kraft Bag Corporation hands you bag filling perfection on a silver tray!

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The Kraftpacker guarantees an 8 oz. plus or minus tolerance—but actually delivers a daily average closer to 4 oz.!

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Plants with Kraftpacker installations report filling 18 to 22 80 or 100 lb. charges a minute, with one man hanging bags—and a daily average of 40 tons per hour, with 10 to 12 change-overs.

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No automatic open mouth bag filling machine of its type will handle free-flowing material easier than The Kraftpacker. Reduces packaging costs at an unbelievable rate.

ECONOMY

The Kraftpacker is a proved money-saver in every way—costs less to buy, less to install, less to maintain.

and . . .

with Kraft Bag Corporation's integrated 2-plant multiwall bag manufacturing facilities, you have *everything* you need for your packaging operation, from one dependable source!

ACCURACY
kraftpacker
HIGH PRODUCTION
®

Ask for representative . . . or brochure

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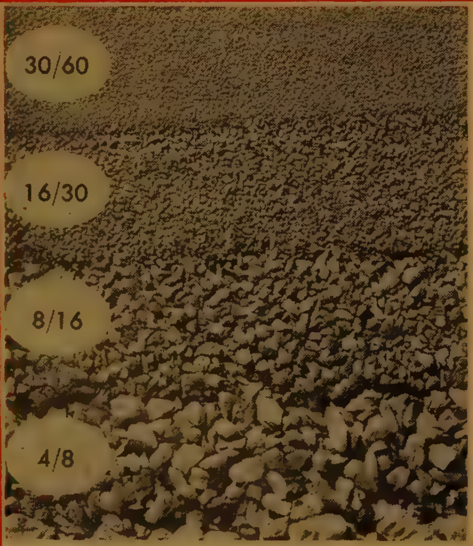
Western Sales Office: Daily News Bldg., Chicago 6, Ill.

Florex and Floridin
granular carriers serve formulators and agriculture best.

Granular pesticide formulations deposit the chemical where it's most effective . . .



ACTUAL SIZE

Although we've been making granular carriers for a half century, recent new techniques in agricultural pest control have proven granular formulations to be efficient, economical and easily applied, with pesticide residues on foliage at harvest time greatly reduced. The method is already established for combating European corn borer, Japanese beetle larvae, white fringed beetle grub, corn root worm, wireworm, mosquito larvae, and other turf and soil pests. Promising results are being observed in cotton insect control, too.

Because of the amphibole-like structure of Floridin adsorptive granular fullers earth products, uniformity and speed in formulation are at their best. Produced in a variety of mesh sizes, including the popular 20/30, 20/40 and 30/60 ranges, regular Florex and Floridin granulars are available for rapid disintegration in water, or in calcined grades for resistance to disintegration in water.

Build your granular pesticide formulations and your fertilizer-pesticide mixtures on Florex or Floridin granules. Use the type carrier which has actually given superior performance in field tests.

Write for information and samples, specifying the mesh sizes you need.

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New Premium Quality Phillips *66* Ammonium Sulfate contains 21% nitrogen, 23.8% sulfur. It is *dry*-cured to remove excess moisture, prevent caking. Uniform dust-free crystals flow freely, mix easily. Ideal for all analyses of mixed goods and for direct application. Available in bags or bulk.

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Get more N per dollar! There are three Phillips *66* Nitrogen Solutions for use in preparation of high-analysis fertilizers and the ammoniation of superphosphate. These solutions keep manufacturing costs low; help rapid, thorough curing.

4 Ammonium Nitrate

Phillips *66* Prilled Ammonium Nitrate contains 33.5% nitrogen. The small, coated prills resist caking, handle easily. Depend on Phillips *66* Prilled Ammonium Nitrate for free-flowing uniform properties and top-notch crop response as a direct application material. It's an ideal companion high nitrogen fertilizer for quality mixed goods.

5 Triple Superphosphate

Phillips *66* Triple Superphosphate contains 46% available phosphoric acid. Ideal for use in formulation of high-analysis fertilizers.

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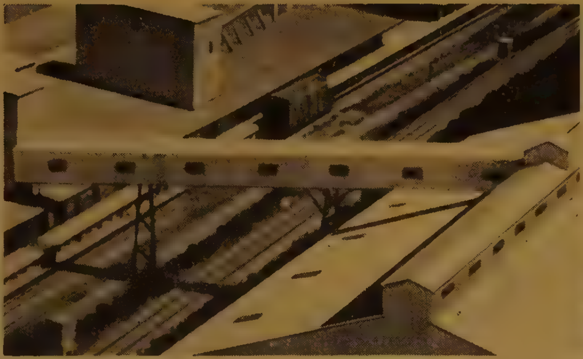

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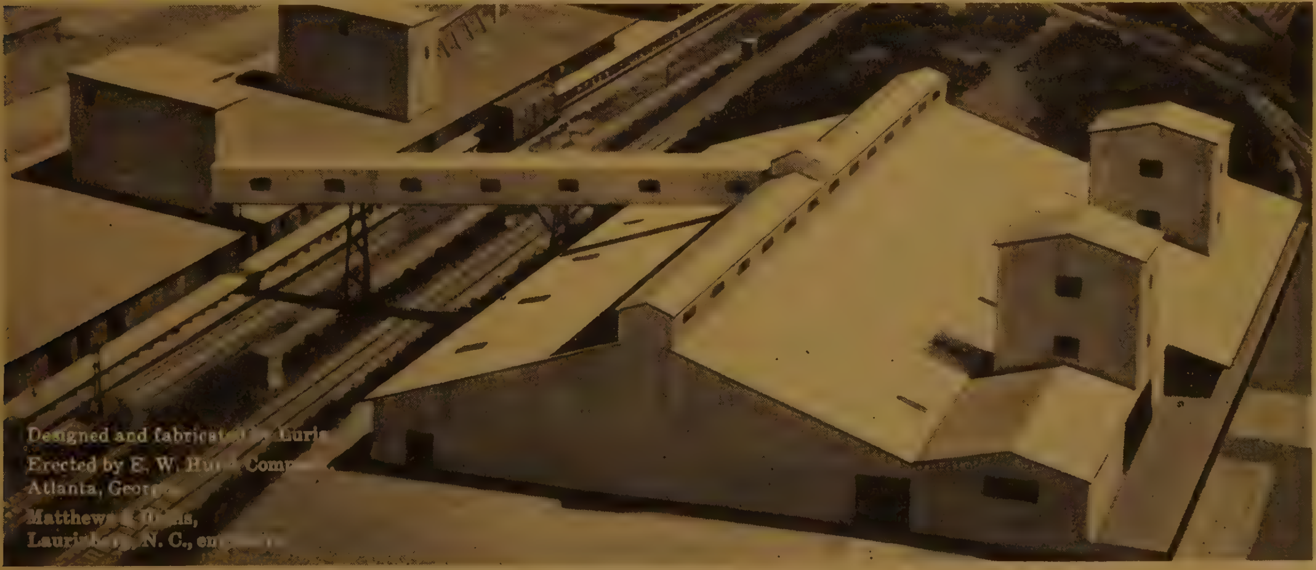

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Continuous Lion advertising appears in leading farm publications, month-after-month, to pre-sell the Lion brand to farmers—and to sell the value of *your mixed fertilizers as well!*

Current advertisements are appearing in Farm and Ranch-Southern Agriculturist, Progressive Farmer, The Farmer, Nebraska Farmer, Kansas Farmer, Prairie Farmer, Wallace's Farmer & Iowa Homestead, Wisconsin Agriculturist and Farmer, Missouri Ruralist and Missouri Farmer. All of these advertisements are in color.

Each Lion advertisement promotes the economic benefits of properly using fertilizers, including Lion Ammonium Nitrate, to help increase the farmer's profits. Each advertisement sells *hard* on the importance of soil tests in the intelligent use of all commercial fertilizers. Lion, a leader in nitrogen production, leads the way to good fertilization practices . . . to better profits for you!

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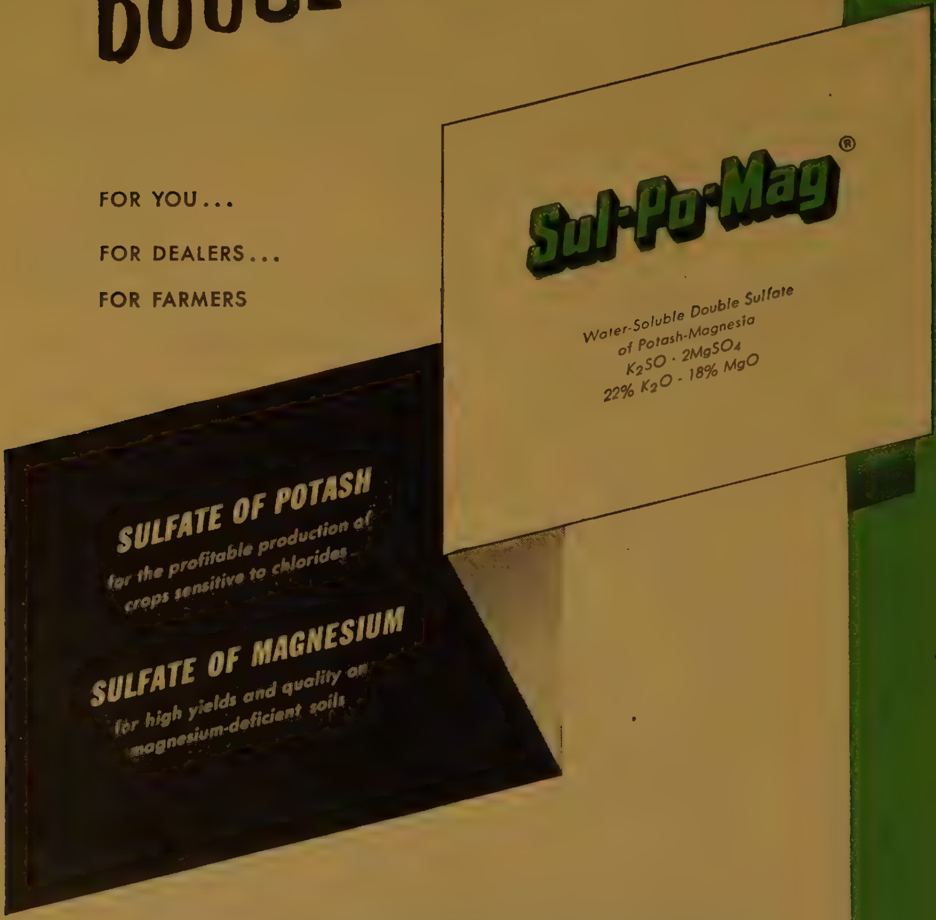
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SULFATE OF POTASH
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for high yields and quality on magnesium-deficient soils

The need for sulfate of magnesium and sulfate of potash for the profitable production of a wide variety of crops in many farming areas is shown by research carried on by many agricultural colleges.

Consistent advertising in farm papers, and on radio and billboards is telling farmers that the most effective way to supply soluble magnesium and potash is to use a quality mixed fertilizer containing *Sul-Po-Mag*. We're building consumer acceptance for your premium grades — so cash in on the growing demand by using *Sul-Po-Mag* in the fertilizers you make for soils low in magnesium and potash. Identify your brand as a premium grade product by showing soluble magnesium in the analysis on the bag . . . *N-P-K.*
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Faster Wetting • *Stable Dispersion* • *Controlled Foaming*

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WEEVIL BREEDING GROUND—This photo of a Texas cotton field shows how snow helped protect the heavy weevil population which went into hibernation. Conditions in many cotton-growing areas were ideal for high survival of boll weevils and other cotton insect pests.

TOXAPHENE dusts · sprays

Ideal conditions for the overwintered boll weevil and a mixed population of other pests—coupled with new government regulations—make it more important than ever before to get the most from every acre planted to cotton this season.

Cotton growers have learned from last year's experience that early-season control of insects with toxaphene pays off in higher yields at picking time. Many farmers who used toxaphene regularly throughout the season obtained excellent weevil control—even in those sections of the cotton belt where infestations were extremely heavy. Some of these farmers reported the highest yields per acre in their experience.

This year every boll counts. Toxaphene applications will protect the crop all through the season. Dealers now have supplies of this dependable insecticide to meet the requirements of their customers.

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NX56-4 (R)

THE CHEMICAL BASE FOR TOXAPHENE IS PRODUCED BY HERCULES FROM THE SOUTHERN PINE

Editorial COMMENTS

THIS season the farmer and the pesticide industry will face their first full season of operation under the Miller amendment. And as we move along toward the heavy insecticide application season it behooves insecticide manufacturers and distributors to hammer away strongly at farmers and pesticide applicators on the absolute necessity of reading labels closely, — and following instructions. These points have been important before, to be sure. But this season failure to read labels and follow directions can mean confiscated crops when the harvest comes round.

Speaking last month in Alabama, Dr. H. L. Haller of the Agricultural Research Service gave some very timely advice, which will bear repetition here, — and frequently elsewhere straight through the season. "Food growers have nothing to fear from the Miller Pesticide Residue Amendment if they follow label directions closely and avoid carelessness in using pest control materials . . . A sound education program which incorporates proper selection of pesticides and their safe use is imperative."

A panel of experts at this same meeting emphasized that one of the most critical factors in pest control is the operator-applicator himself. "The cause for most failures in pest control," emphasized W. A. Ruffin, "is people not knowing enough about insects or insecticides."

It's up to the insecticide manufacturers to see that they get this information, — more important this season than ever before. And the best precaution the industry can take in avoiding trouble is to keep hammering away at the double barrelled necessity of reading labels and following directions.

AFTER setting an imposing series of records year after year in moving its product into consumption, the fertilizer industry this season faces a couple of serious road blocks. A delayed spring has set back planting in many areas and interfered with normal movement of fertilizer and fertilizer raw materials into the pipelines. The usual fears are being expressed that when demand finally develops, mixing, shipping and distributing facilities will be found unequal to the task of supplying all the materials that will be needed within a short period, and as a result consumption may suffer.

Failure of Congress to agree on a farm bill which the president can sign has been another serious blow. Election years always emphasize political considerations, and the farm bill has unfortunately degenerated into a real political tug-of-war this year, with little apparent chance of working out any sensible solution. The "outs" find it politically expedient to outpromise the "ins," and in the ensuing disagreement the farmer fails to get the relief that all agree he must have if our agriculture is to continue prosperous. Indirectly the fertilizer industry, — and everyone else who sells the farmer — will suffer too.

Fumarin . . .

a new hydroxycoumarin anticoagulant rodenticide

By William H. Robison and D. Glen Crabtree

U. S. Department of the Interior
Fish and Wildlife Service
Wildlife Research Laboratory
Denver, Colorado

USE of anticoagulant rodenticides by pest control operators and by the general public has demonstrated that these materials offer effective and practical methods for the control of commensal rats and mice. Many field trials, using the multiple dose technique (1), have shown that 90 to 100 percent control can be obtained. The animals do not develop bait shyness, nor build up a protective tolerance. This class of compounds offers the additional advantage of minimal hazard to man and domestic animals, due to the low concentrations employed in baits, and the availability of antidotal treatments (2, 3). Authenticated incidences of secondary poisonings have been few and far between (4).

As a part of its continuing search for more effective, safer, or cheaper rodenticides, the U. S. Fish & Wildlife Service has conducted tests on a number of candidate anticoagulant rodenticides. One of these compounds, "Fumarin" (the coined name for 3-(Alpha-Acetonyfurfuryl)-4-Hydroxycoumarin) was found to be highly effective under laboratory conditions (5). Field studies on Fumarin were instituted in the summer of 1954 in cooperation with the American Chemical Paint Co. of Ambler, Pennsylvania, and assisted by the Branch of Predator and Rodent Control (6). Laboratory studies were conducted at the Wildlife Research Laboratory in Denver, Colorado, while field studies were carried on in the several states listed, and under supervision of the district agents involved.

Field Tests

DISTRIBUTION of cereal baits containing 0.025 percent Fumarin to field investigators was begun in September 1954, and field studies were terminated in May 1955. Reports from 74 individual investigations, and two composite area-wide reports are summarized in tables I, II, III, and IV. These reports were graded "A", "B" or "C", based on results. Thus, reports of good results (75 - 100 percent control) were given an "A" rating; fair results (40-74 percent control) were given a "B" rating, and poor results to complete failure were given a "C" rating.

The "area-wide" reports are from tests conducted in cooperation with the Health Department in Columbus, Mississippi, and with the City Administration in Jackson, Tennessee.

In the case of the three individual treatments which are regarded as failures in the 74 reports analyzed (Table 1) the rodent populations infesting the farms involved refused to accept cereal baits and continued to feed on whole grain stored on the premises. Thus these failures are attributable to bait composition and do not reflect failure of the active ingredient Fumarin to control the infestations present.

An interesting observation from the Texas reports indicated that under their field conditions, exceptionally good mouse control was obtained, whereas, the results of the laboratory tests with mice were on a par with other similar 4-hydroxycoumarin type anticoagulants.

Laboratory Studies

SINCE a Fumarin-cereal bait was proved an effective rodenticide by both laboratory and field tests, further laboratory study was undertaken to determine the stability of such a bait.

A Fumarin bait consisting of:

Breakfast rolled oats (U. S. Army Type II)	32.5%
Yellow degerminated corn meal	32.5%
Ground Purina Fox Meal with meat	10.0%
Stream-treated bone meal	10.0%
Sucrose (beet sugar)	5.0%
Mineral oil	5.0%
(0.5% Fumarin concentrate	5.0%

and a control bait of the same composition, except that cornstarch replaced the 0.5 percent Fumarin concentrate, were prepared, placed in hermetically sealed cans, and stored at room temperatures. After 3, 6 and 9 months storage, bioassays were conducted as follows:

Three groups of 10 male rats each were weighed and placed in three test cages. In one cage Fumarin and control bait were offered; in another cage Fumarin and normal rations (Purina Fox Checkers) and in the third Fumarin bait and yellow de-

TABLE I

Composite Reports of Urban Areas Treated for the Control of Commercial Rats and Mice

Type of Infestation Treated	Degree of Success Attained			Number of Reports	Percentage of success A X 100 A & B & C
	A	B	C		
Rats, Norway* and Roof	15	0	1	16	93.8
Roof rats only	31	1	1	33	94.9
Mice only	3	0	0	3	100.0
Rats & Mice	21	0	1	22	95.4
Total of trials against rats	67	1	3	71	94.4
Total of trials against mice	24	0	1	25	96.0
Total all trials	70	1	3	74	94.6

* No field trials against Norway rats only

TABLE II

Distribution of Individual Reports

State	For Control of rats only	For Control of mice only	For control of dual infestation of rats and mice	Total Number Reports
Arkansas	21	0	1	22
Louisiana	13	0	5	18
Mississippi	2	1	9	12
Texas	13	2	7	22
Total	49*	3	22**	74

* 20 of these reports were for the control of roof rats.
** 13 of these reports were for the control of roof rats.
88 (total)

TABLE III

Composite Results of Individual Exposure for the Control of Commercial Rats and Mice

State	City	Number of Premises Treated	Degree of Success Attained
Mississippi	Columbus	275	A
Tennessee	Jackson	81	A
	Total	356	

germinated corn meal. Water was freely available at all times. The results are presented in Table IV shown at the bottom of this Page.

In 10 of the 12 tests, 90 percent mortality occurred within the first 14 days, a fact which should be considered in interpreting the column headed "Days Until Last Death." The variations encountered in these tests were no greater than normal expectations, although the bioassays were made at different times of the year.

It was found that these baits were stable, did not develop rancidity, nor were there any significant changes in toxicity, acceptance or physical characteristics. No mold growth or insect infestation occurred during the test period.

Conclusions

WHEN properly exposed, cereal baits composed of 1 part 0.5 percent Fumarin starch concentrate and 19 parts of cereal bait material will effectively control infestations of commensal rats and mice. Such Fumarin cereal baits placed in hermetically sealed cans will retain

(*Turn to Page 127*)

TABLE IV

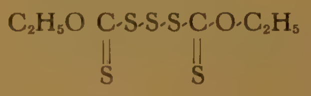
Bio-assay	Beginning date	*Bait and food exposed	No. of rats used	Total weight of rats on beginning date in grams	Total amt. of bait consumed in grams	Total amt. (in grams) of food consumed	Days until first death	Days until last death	Percentage killed
No. 1	10/7/54	F&C	10	2715	86	1046	4	21	100
2	1/4/55	F&C	10	2693	122	1462	7	28	100
3	3/21/55	F&C	10	2424	187	1588	4	32	100
4	7/13/55	F&C	10	2232	144	676	5	16	90***
1	10/7/54	F&F.C.	10	2850	599	**	3	13	100
2	1/4/55	F&F.C.	10	2584	604	—	4	24	100
3	3/21/55	F&F.C.	10	2544	656	—	7	8	100
4	7/13/55	F&F.C.	10	2579	355	—	5	6	100...
1	10/7/54	F&CM	10	3010	265	671	5	11	100
2	1/4/55	F&CM	10	2976	353	598	6	20	100
3	3/21/55	F&CM	10	2608	180	803	7	12	100
4	7/13/55	F&CM	10	2416	285	603	5	16	100

* F&C—Fumarin bait and control bait
F&F.C.—Fumarin bait and fox checkers
F&CM—Fumarin bait and yellow degerminated corn meal
** It was not possible to determine the consumption of the fox checkers due to waste through the cage floor.
*** Bioassay terminated on the 16th day

Defoliant 713 on a Cotton Field Near Plainview, Texas

THE chemicals available today for maturing cotton are either of the defoliating or desiccating type. Often a desiccating action can be obtained with an excess of defoliant, but the amount of leaf drop is greatly reduced. Desiccants are not expected to drop many leaves except by the breaking of dried petioles. If a material could be found that would give a good leaf drop and desiccate the remaining leaves, it would be useful in many of the cotton growing sections. Attempts to combine defoliants and desiccants in one application have not been successful. Defoliant 713 is the first chemical to give a combined action where rapid desiccation does not interfere seriously with leaf drop.

The material appears to be a mixture consisting principally of di (ethylxanthogen) trisulfide



$$C_2H_5O\ \underset{\underset{S}{\|}}{C}\text{-}S\text{-}S\text{-}S\text{-}\underset{\underset{S}{\|}}{C}\text{-}O\text{-}C_2H_5$$

It is a heavy, amber-colored liquid having a specific gravity of 1.3. It is soluble in petroleum oils which are used as carriers in the application. The defoliant has been furnished as a 25 per cent solution (two pounds per gallon) in an isoparaffin oil and as a 100 per cent concentrate. It has a mild characteristic odor which is dissipated rapidly after application. In our experience it has not caused irritation of the operator or other ill effects. The chemical has not caused corrosion of spray equipment.

Description of Action

DEFOLIANT 713 acts very rapidly in most instances. If applied in the morning, the cotton leaves are often wilted in the afternoon. Apparently it is absorbed rapidly by the leaves because a heavy rain within an hour after application does not reduce the effect. In fact, application on wet foliage appears to improve the action. Sunlight is necessary for good results. It should not be applied later than four hours before sunset. Some applications made after dark will show an effect the next day, but the speed of action is slowed and the effect is more mild. Best results are obtained on warm days. Low temperatures slow the action.

Mature leaves form abscission layers very readily, and many less mature leaves are dropped in this way. However, the immature leaves are more often desiccated unless a good coverage at the correct dosage is obtained. There is some darkening of the top side of the bolls, but this does not carry through to the inside. It does not "freeze" the bolls shut, but instead it accelerates the opening. Sometimes a few very small, immature bolls are shed, but these would never mature if left on the plant.

The material must come in contact with a leaf to cause abscission. It does not appear to be translocated. It is desirable to have an even coverage, but mature leaves abscise when only a small portion of the area is affected.

Results

BEGINNING in the laboratory, where cotton was grown under greenhouse conditions, Defoliant 713 has been tested under a great variety of conditions. From the laboratory it was taken to the field and applied to small plots. Later larger plots were sprayed by tractor or by airplane. Finally it was applied on large fields in the regular manner.

In earlier defoliation studies micro amounts were applied to individual leaves with a syringe and needle. Soltrol was used as the solvent because it spreads readily over the leaf surface. It was easy to cover a medium sized leaf with 0.05 ml of solution.

Most of the tests were made by spraying into a Peet-Grady chamber from three sides and allowing the mist to settle on a plant placed in about the center of the floor. The floor is six feet square, so the dosage can be calculated on the acre basis. Usually 15 ml of solution was sprayed, containing 0.3 ml of the active ingredients. The mist was allowed to settle 30 minutes. This is equal to 1.03 pounds per acre in 4.8 gallons of solution. Table I gives some typical results on cotton from 1 to 2.5 feet high. This method is excellent for laboratory studies because it gives a uniform deposit on all leaves.

SUMMARY

Phillips Defoliant 713* has had a widespread experimental evaluation for two seasons, and in view of the generally favorable response a report has been prepared. The chemical is described, and a cross section of the results obtained in the laboratory, at experiment stations and in the field are given. The material is believed to consist principally of di (ethylxanthogen) trisulfide. It is a heavy, amber-colored liquid having a specific gravity of 1.3. It is soluble in petroleum oils which are used as carriers in the application. It has been furnished as a 25 per cent solution (2 lb. per gallon) in an isoparaffin oil and as a 100 per cent concentrate. It has a mild characteristic odor which is dissipated rapidly after application. Defoliant 713 has the properties of both a defoliant and a desiccant. Assuming good coverage is obtained, two to three pounds of active ingredient per acre on average cotton has given about 75 per cent defoliation, and it desiccates most of the remaining leaves. The performance has been consistent under varying climatic conditions and on several cotton varieties.

Our observations have shown that it gives a rapid action and is not affected by rainfall immediately after application. It has not frozen the bolls shut as is sometimes the case when a desiccant is used. Also, in our experience, it has produced no corrosion of spray equipment nor caused an irritation or other ill effects to operators in spray applications. In general, Phillips 66 Cotton Defoliant 713 has produced very favorable combined defoliating and desiccating effects on cotton leaves as evidenced by reports of competitive field tests as well as results of field trials and use on cotton farms.

Defoliant 713

By Lyle Goodhue and Charles Osborn

Phillips Petroleum Co.
Bartlesville, Okla.

Small Plot Spray Cart

The spray cart shown in the photograph was constructed to apply accurately known quantities of defoliant to small field plots. The photograph, Figure 1 shows the general appearance of the apparatus. The spray was applied from 8 x 1 Chicago Spraying System nozzles distributed over an inverted U-shaped boom. Adjustments for the height of the cotton were provided. The solution was held in one-gallon light weight oxygen cylinders that had been equipped with a filling plug. The cylinders were pressurized from a 15 pound capacity carbon dioxide tank through a reduction valve. A valve at the outlet (bottom) of the defoliant-containing cylinder was usually adjusted to give 40 psi on the nozzle boom. Adequate screening reduced nozzle clogging to a minimum. Good coverage could be obtained on cotton up to two feet

TABLE I

Results of Spraying Cotton In A Six Foot Cubical (Peet-Grady) Chamber

Ml of Defoliant 713 in 15 Ml Solution	% Defoliation After One Week
.55	90
.375	89
.3	95
.3	93
.3	94

TABLE II

Typical Results With Defoliant 713 On Small Field Plots As Applied By Spray Cart

Location	Year	Pounds/Acre in 10 Gal. Diesel Fuel	Per Cent Defoliation After One Week
Nowata, Oklahoma	1954	2	92
Chickasha, Oklahoma	1954	2	97
Stoneville, Miss.	1954	2	81
Weslaco, Texas	1954	2	85-90
Weslaco, Texas	1954	1½	78
Chickasha, Oklahoma	1954	1½	97
College Station, Texas	1952	1½	72
Weslaco, Texas	1953	1½	88
Temple, Texas	1953	1	73
Chickasha, Oklahoma	1954	1	97
College Station, Texas	1954	1	73
Weslaco, Texas	1953	1	88
Temple, Texas	1953	1	68

TABLE III

Results of Field Plot Tests Where Defoliant 713 Was Applied By Tractor Sprayer

Location	Year	Pounds/Acre in Petroleum Solvent	Per Cent Defoliation
Temple, Texas		2	78
Silkston, Missouri	1954	2	73
Stoneville, Miss.	1954	2	60
College Station, Texas	1953	2	94
Blackville, South Carolina	1954	2	73
Curtis, Louisiana	1954	2	73
Socation, Arizona	1954	2	50-60
Los Cruces, New Mexico	1954	2	50-80
Chickasha, Oklahoma	1954	2	54
Weslaco, Texas	1953	1½	86
Stoneville, Miss.	1953	1½	80
Chickasha, Oklahoma	1953	1	97
Chickasha, Oklahoma	1954	1	72

TABLE IV

Results of Field Plot Tests Where Defoliant 713 Was Applied By Airplane

Location	Year	Pounds/Acre in 3-5 Gal. Diesel Fuel	Per Cent Defoliation
Stoneville, Miss.	1954	2	90
Stoneville, Miss.	1954	2	70
Stoneville, Miss.	1954	2	50
College Station, Texas	1954	2	85
College Station, Texas	1953	2	50-75
Plainview, Texas	1954	2	90+
Waco, Texas	1953	2	75

high even in a moderate wind because the spray boom was almost completely enclosed. The amount applied was determined by calibrating the nozzles at various pressures and pulling the cart at the required rate of speed. The cart can be taken apart easily and transported in a station wagon.

Table II gives some typical results of tests in various sections of the cotton belt. Only the per cent defoliation was recorded, but in most instances leaves not dropped were desiccated.

Field Plot Tests

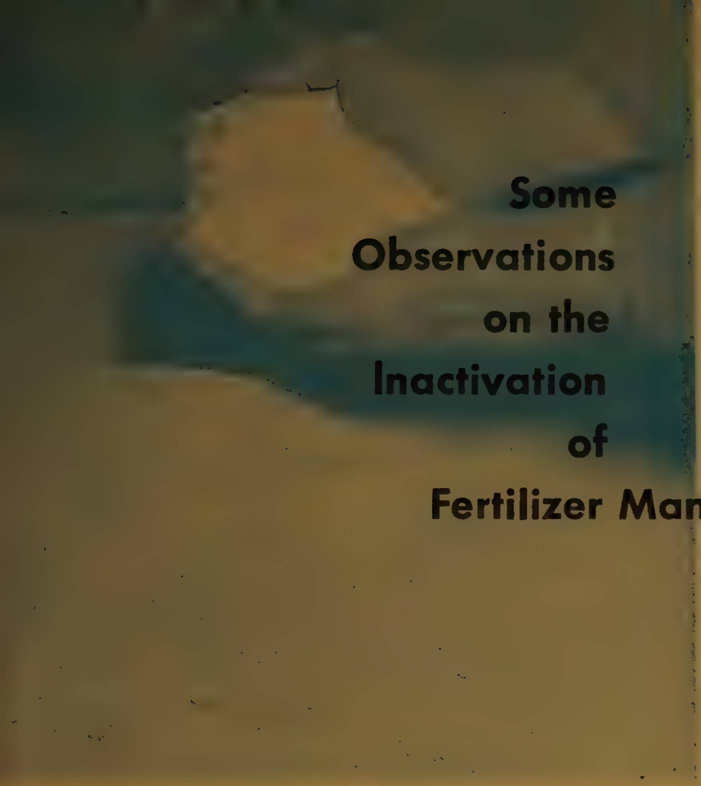
After the small plot tests showed that 713 would defoliate cotton in the field, numerous applications were made with a tractor mounted sprayer. Many of these were on the various experiment stations in comparison to other defoliants. The coverage obtained by the various sprayers and wind or other weather conditions affected the results. In these tests the per cent defoliation varied from nearly complete down to near 50 per cent. Often the remaining leaves were desiccated. The low results were generally attributable to poor coverage. In some places the cotton was so large that good coverage by conventional equipment at the recommended rate was impossible. The results are shown in Table III (1,2).

In addition, some plots were put on by airplane and the results estimated or determined by counting tagged plants. The variation was about the same as in the tractor applied tests. Typical results are given in Table IV (1,2).

Defoliant 713 Concentrate 100%

All of the above results in field plot tests were from the use of twenty five per cent Defoliant 713 in Soltrol,* an isoparaffinic hydrocarbon. This season a number of plot tests were applied using a 100 per cent concentrate of Defoliant 713. At the same rate per acre this new material is more effective. It desiccates young leaves better, retards regrowth longer and gives a stronger action in all respects. It was applied in 5 to 10

(*Continued on Page* 127)



Some Observations on the Inactivation of Fertilizer Manganese Compounds in Soils

by S. Trocme' and G. Barbier

*Members of the National Institute of Agronomic Research, Versailles, France.

IT frequently has been reported that correcting a manganese deficiency is more easily facilitated by dusting a manganese salt on the foliage of affected plants than by incorporating it in the soil (1).* Manganese deficiency symptoms identified recently in the environs of Paris enabled us to make some new tests to check on the validity of these reports.

This deficiency is found on sandy soils devoted to market gardening where sewage water is purified from the city of Paris, particularly on those fields which are heavily irrigated; in sumps where water accumulates; in strips near irrigation ditches; and in soil areas subjected for a long time to intensive irrigation which support at best a sickly, chlorotic type of vegetation. By making comparative analyses of sick and normal plants we were enabled by an examination of the external symptoms to diagnose a serious shortage of manganese which, in the course of our tests, was rapidly and completely replenished by spraying the foliage with a solution of 0.25 or 0.12% $MnSO_4.H_2O$ or by means of finely ground manganese sulfate powder applied at the rate of 25 to 50 kg per hectare. (leeks, spinach, beans, peas, potatoes.)

On the other hand, the incorporation in the soil of manganese compounds was not effective except at very high dosages; the only positive result that we got was the following: application on March 15th of 800 kg. or 1,600 kg. of $MnSO_4.H_2O$ per hectare, half applied on the surface, the other half placed at a depth of 25 cm. The average weight of a leek in October was:

Check	800 kg. per ha.	1,600 kg. per ha.
63 gm.	106 gm.	125 gm.

All the other tests comprising applications of manganese sulfate from 25 to 300 kg. per hectare gave us no result, whether the incorporation had been made by tillage a fortnight prior to the seeding (beans) or by burying it superficially following the seeding (peas), or still by tillage a few days before transplanting (leeks), which is to say, in this latter case, a very few days before the plant was able to utilize the applied manganese provided that it was still in an available condition.

A manganese carbonate (solubility in water: 4 mg Mn. per liter) applied at rate of 40 to 160 kg. per hectare (16 or 66 kg. per hectare of Mn) was as ineffective as the very soluble salts. No absorption of any manganese whatever was detectable in the analysis of plant tissue during its vegetative growth.

In pot tests, using deficient soils, oats showed manganese deficiency symptoms even after an application of manganese sulfate equivalent to

SUMMARY

Deficiencies of manganese affecting market gardening soils irrigated with sewage water from the city of Paris are much more easily corrected by dusting the crop foliage with manganese salts than by incorporating them into the soil. Such salts are quickly rendered insoluble, essentially by biological oxidation. The authors offer an hypothesis to explain that the products resulting from the oxidation of soluble fertilizer manganese are less effective than the oxidized forms which are naturally present in the soil.

Note: This article has been translated by V. Sauchelli.

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*Numerals in parentheses refer to literature references at end.

200 parts of Mn per million parts of dry soil. It is true that oats, while showing a very variable susceptibility according to the variety, are nevertheless always extremely sensitive to any shortage, much more so in this respect than the legumes.

These observed facts should never be generalized. For example, in Brittany where manganese depletion appears following heavy applications of lime to acid muck soil, Coppenet (2) has observed that the addition of manganese sulfate buried just below the surface at the time of seeding, at rates of 50 to 100 kg. per hectare, doubles and at times trebles the weight of the oat grain. This effectiveness is still more marked at the end of a year: the yield of an oat crop following a potato crop having received 100 kg. of manganese sulfate per hectare having been tripled.

Why manganese salts are ineffective in irrigated soils

The soils of Achères kept at a humidity of 20% and at about 20°C temperature under aerobic conditions rapidly fixed the manganese from sulfate of manganese to a non-exchangeable form (i.e. not extractable by percolation of 25 gms of soil with 300 ml of a normal solution of ammonium acetate having a pH=7.1). This is summarized as follows:

By adding some toluene to the soils of Achères an important portion of the Mn++ incorporated remains in the exchangeable form, and this confirms the observation that biologic oxidation plays a preponderant role in the immobilization of manganese (3) but one cannot conclude that Mn may be equally inactivated by a non-biologic oxidation process. As an example consider a reaction in which the two atoms of a molecule of oxygen fix themselves the one upon a polyphenol, the other upon an MnO. One can also envisage how adsorption could block off MN++ ion irreversibly.

In fact, we have not been able to demonstrate for certain these latter two fixation mechanisms: the major portion (at least 75%) of the MN++ adsorbed or fixed by a pure clay (kaolinite) or by a pure limestone was easily extractable by a normal solution of calcium nitrate or neutral ammonium acetate. Both the clay and the lime retained their white color which makes us suppose that the MN++ had not been oxidized. We have otherwise verified that in the case of the limestone Mn++ remained in its bivalent state (no oxidation by oxalic acid).

No. of soils	1	1	2	2
ppm Mn incorporated in soil	0	49	0	49
ppm Mn exchangeable after 8 days	0.9	1.1	0.9	1.0
ppm Mn " " 35 days	0.8	0.9	0.9	0.9

*Gray oats of Versailles, a variety having an average tolerance to Mn shortage

Coppenet (2) has reported analagous results on deficient soils in Brittany, as follows:

ppm Mn incorporated in soil	15	150
ppm Mn exchangeable after 1 hour	8.5	94
ppm Mn exchangeable after 48 hours	0.5	0.5

Similarly the Mn++ adsorbed by a calcic humate of peat (colloidal suspension of 1 0/00 $MnSO_4$, shaken and flocculated by $Ca(NO_3)_2$) remained extractable by a neutral normal solution of ammonium acetate after several weeks (conserved by means of toluene) or after drying; and we have not observed any irreversible fixation by the humates.

All these facts confirm the preponderant part played by biologic phenomena in making manganese salts in the soil less available. One question arises: in the tests with the Achères soils previously discussed, we stated that deficiency symptoms paralleled a soil manganese depletion amounting to some 400 kg. per hectare due to the leaching of this element following the reduction of the oxidized forms by the organic matter contained in the sewage water. To this action is added the protective action of the humic residues or of the limestone which upon depositing themselves on the clay particles, remove the Mn++ from this reduction effect. (4) One may ask why are the products of the oxidation of the manganese salts incorporated into the soil inactive (except for very large dosages), whereas the nutrition of the plants is normally assured by the higher oxides present in the soil and subjected to the action of reducing or solvent agencies? But the Mn thus incorporated remains localized in the small number of soil particles which are found in contact with the fertilizer manganese and which have adsorbed the Mn++ prior to the time that they are oxidized on the spot. The attack on them by the reduction or solvent agencies later on carried out by microorganisms or roots must be less rapid than if they were found disseminated upon a large surface. It is therefore conceivable that the products resulting from the oxidation of the soluble fertilizer manganese might be less effective than those oxidized forms which pre-existed in the soil in the disseminated condition.

This hypothesis accords with the fact that positive results are obtained with higher rates of application, namely, 300 to 600 kgs. of Mn++ per hectare even 6 months after their application whereas applications of 100 kgs. of Mn++ (representing 500 times the consumption of a single crop) remain ineffective. Nevertheless many more tests are still necessary before we can know whether the Mn++ thus incorporated into the soil at heavy rates goes through oxidized forms before it can be absorbed by crops.★★

Literature Cited

(1) Wain.. *Jour. Agr. Science* 33—1943

(2) Coppenet and Voix. C. R. *Acad. Agr. France*, 1951, No. 1

(3) Gerretsen. *Verslag. Land. Onderzoek.* No. 42, 57 (1936). Mann & Quastel. *Nature*, 158 (1946) p. 154

(4) S. Trocme' et G. Barbier. *An. Agr.* No. 5, 1950

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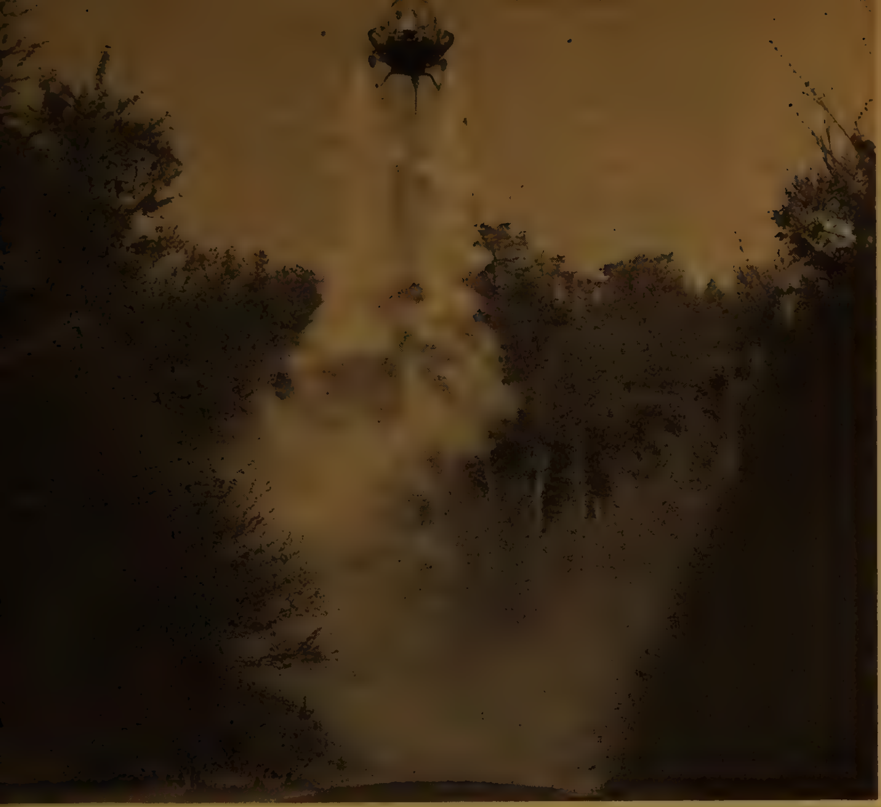
Fertilizer Table Values

T. P. Hignett, author of the article on "Pilot Plant Studies of Granulation of High-Analysis Fertilizer," appearing on pages 34-36 of the March issue of *Agricultural Chemicals*, advises that the following are the correct values for the last line of Table 1, appearing on page 34:

J-1	J-2	J-3	J-4	J-5	J-6	J-7
72	80	88	83	91	—	87



Community Aerial Spraying

by Jack Kenealy*

THE Cankerworm, or inch worm, is a general feeder, and when an infestation reaches the epidemic stage, this fact is readily apparent to even the casual observer. Acres of woodland may be rapidly defoliated and its scenic beauty ruined for weeks to come, but more important is the tree loss by lowered vitality as a direct result of defoliation. Also it must be considered that for weeks to follow the entire area is a complete loss for recreational purposes because of the constant rain of both insects and insect droppings.

Lower Merion Township, a part of Montgomery County, Penna., is immediately adjacent to the City of Philadelphia. Including the communities of Ardmore, Bryn Mawr, Merion and Rosemont, it is roughly rectangular in shape, approximately six miles long and four miles wide. The dominant physical feature is the Schuylkill River, which borders the Township on the north and east for over seven miles. The comparative isolation and natural beauty of the area have encouraged the establishment of country estates and large suburban homes. This type of development has made it possible to preserve most of the heavily wooded area of mixed hardwood.

Approximately seven years ago we noticed Cankerworm damage appearing along the upper portions of the river. In about four years this infestation had spread seriously over 7,000 acres.

It would be easy for those responsible to simply say: "This is a private matter. We have our hands full with the protection of roadside trees." With the newer mist blower equipment, it is not too great a problem to spray roadside trees. However, in our opinion, an attitude of this type represents a gross neglect. We have an interest in all trees, regardless of location, and we feel we have a duty to all property owners. Infestations of this sort border at least on being a public nuisance. Conventional commercial spraying, extensive enough to be of much benefit, is impossible for many reasons, such as inaccessible areas, property owners who either cannot afford complete spraying, or lack of interest, etc.

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*Lower Merion Township, Shade Tree Commission, Ardmore, Pennsylvania.

During the early spring of 1954 we felt the answer would be aerial spraying. We considered it, but preferred avoiding it if possible because of opposition from several sources. At the end of the 1954 invasion, however we asked Dr. Clyde G. Hamilton, Research Specialist in Entomology of Rutgers University, to look over the area. After his visit, we were sorry that we had failed to face our problem squarely, and immediately started plans for aerial spraying the area in 1955.

In our quest for information prior to starting our program we were surprised at the reluctance of many people to call a spade a spade. There seemed to definite opinions concerning the advisability of such programs in unsettled forest areas, but little information of value which could be applied to a residential area such as ours. Faced by this situation we contacted several agencies which we hoped could be of assistance. Among these were the Scranton Audubon Society, Massachusetts Audubon and the American Audubon, the United States Department of Agriculture, United States Wildlife Society, Dr. Clyde Hamilton and the Pennsylvania Department of Agriculture. All of these except our own State Department of Agriculture were most helpful and cooperative. The information from the various agencies made it possible to plan our program carefully.

The concensus of opinion was that small dosages per acre would be effective and not harmful or dangerous. It would not be completely accurate to say the bird people were enthusiastic about our plans. They would have preferred, of course, that programs of this sort were not necessary, and I am sure we agree. Their chief concern was the danger of overlap in the spray pattern and the possibility of getting an excessive concentration of material in some areas, thereby placing the birds under hazardous conditions and, of course, the loss of food. The fish people were in agreement that even one pound of DDT could be harmful, and suggested precautions. All this information was helpful and was appreciated.

Aerial spraying in a residential area in Pennsylvania found to be a successful and practical operation with 90% control.

Since large private acreages were involved and since our people are civic minded and are well represented in all areas with organizations, we decided to call meetings and present our plan for aerial spraying. Without exception we found enthusiasm, with each civic area willing to contact the residents within their area and arrange to collect the three dollars and seventy five cents per acre our contractors had agreed upon.

Our next step was to release information for publication, and then the fun started. We had expected a certain amount of opposition but had hoped it would be reasonable. Not many, but a few people who prefer the organic way came forward with "Letters to the Editors" and, of course, created some opposition and quite a little confusion. This, of course, added problems to our already crowded schedule. However, I have always felt people have a right to their opinions, and certainly sympathize with the honest opponents of a program of this sort.

One of the published letters in opposition appeared over the signature of a University Professor. His name and connections were impressive, not to us but to a lot of people. This letter predicted disastrous results to all Nature. The other people in opposition and the professor all had one thing in common—they were not familiar with research. The quotes were all from very early work done with DDT against gypsy moth. We all know five pounds per acre were used and the damage to birds and fish was fully reported.

In situations of this type sometimes it is necessary to fight fire with fire so we issued a prepared statement from Dr. Hamilton; this played an important part in clearing up the confusion.

After daily visits to our isolated check areas we concluded on the evening of May 6th that the hatch and activity of the insect justified spraying. We would have preferred that the ash, white oaks and walnuts be a little more advanced, but waiting or delaying the program seemed unwise. The weather was ideal and it was felt the insect would kill better as soon after hatching as it was possible to spray. A call that evening alerted the flyers to start at daybreak on May 7th. Spraying started as planned and the work was completed on May 10th.

We were hopeful for seventy percent control and this would have satisfied us. As near as we can determine however, we realized better than 90% control.

Careful daily checks were made at previously designated areas to determine the percentage of kill to a known population, damage to beneficial insects, birds and wild life, including fish. Up to the present time, eight months later, we have found no measurable damage. Our daily checks were discontinued after two weeks.

The only complaints received, with two exceptions, were from people who felt their rest had been disturbed by the low flying planes during the early hours, and, of course, in spite of what we considered ample warnings, we had a few complaints from people who were concerned about the spray on automobiles. These were not damaged.

Since we have had this experience, we would not hesitate repeating such a program, or recommending it where a major insect infestation is evident.★★

Atomic Energy in Agriculture

By Sterling B. Hendricks
USDA Agricultural Research Service
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ATOMIC energy is a rather loose term covering the subject of nuclear fission and the associated radioactive phenomena. As a source of energy, it potentially is useful to man and the purpose here is to examine the way in which it touches on agriculture, including work with insects and insecticides.

The approach will be the indirect one of giving some of the background information for nuclear fission. In this way you should be able to judge for yourselves the extent to which it might be useful to agriculture, in general, and agricultural chemicals, in particular.

Before speaking about the nature of nuclear fission, let me recall your attention to the fact that the matter is before us because of the atomic bomb. You should never forget that the atomic bomb abruptly terminated one war and is a factor of military potential in the relationships, including wars, between nations in the future. This is all unfortunate in a humanistic sense and serves to divert attention from the fact that nuclear fission is a crowning attainment in the progress of man's control of energy sources.

Radioactivity first gave evidence of the inherent instability of the nuclei of some elements such as uranium and radium which implied that these atoms have an internal source of energy. It was Einstein, who found from his own special theory of relativity, that the source of this energy was in the transformation of mass (M) to energy (E) according to the equation,

$$E = MC^2$$

where C is the velocity of light. The velocity of light is a very large quantity and its square is immense.

When the masses of the nuclei of elements are based on a common scale, it is seen that combination of light elements, such as hydrogen, would liberate mass and, thereby, energy. It is this reaction from which the sun draws its energy. Near the center of the sun at a temperature of about 1,000,000° C. hydrogen nuclei combine with carbon nuclei, eventually to form oxygen that breaks to give helium and carbon. The reaction is essentially the combination of four hydrogen nuclei to form one helium nucleus. There is a loss of about three-fourths of one percent of the mass which appears as energy.

The sun is man's first concern with atomic energy and incidentally the first requirement of agriculture. The reaction of the sun is what is implied by the term "Hydrogen Bomb", but an actual thermonuclear device might use other isotopes than hydrogen of mass one.

In the case of the heaviest elements, such as uranium and plutonium, mass is lost when they are broken up to form lighter elements. The basic question is how to induce the change and liberate the energy corresponding to the change in mass. This depends upon the neutron, has about the same mass as the hydrogen atom and is uncharged. Being uncharged it can wander in and out of the neighborhood of atoms without being repelled by their very high electric fields. In the end, neutrons can enter nuclei and increase the mass by one unit. Such modified heavy nuclei, in many cases, will undergo cleavage. In this cleavage, mass is set free and also more neutrons. The multiplication of neutrons results in a self running process, which is the basis for the atomic pile or the nuclear reactor or even the atomic explosion if uncontrolled.

If this were all, matters would be in a happy state. Unfortunately, though, in the fission of the heavy nuclei other nuclei are formed that have excess energy and are radioactive. In a sense these are a waste product in manufacturing terms, that is, most objectionable if the interest

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is in the use of the power. It is the radioactivity that gives the greatest peculiarities to nuclear fission, and the most serious implications to the use of atomic devices in warfare as threats to all mankind rather than just your current enemies.

This brings us to what "Atomic Energy" is for agriculture or anything else. It is, first, energy, second, radioactivity, and, third, radioactive isotopes. It is in these terms that we have to discuss applications in agriculture.

Energy in Agriculture

ENERGY is the most attractive of these. To realize that a ton of granite due to its small uranium content has as much potential for energy as a ton of coal surely must hold the imagination. But to note the immense power plants associated with the production of fissionable materials gives some pause to think on the overall economy. It is difficult for anyone freely to assess the cost of atomic energy at this time or its probable future cost. The difficulty lies in the charge for fuel and the credit for fissionable products as well as in the true cost of capital investment. But for large installations, it would seem that one is within a several-fold factor of allowable cost.

Is there, then, any place in agriculture where the power development might be of interest? One that is sometimes mentioned is the recovery of usable water from the sea by some distillation process. This is surely unattractive. The place where most energy enters into agricultural work at this time at a point of concentration is in the production of nitrogenous compounds. The present industry is based on the Haber or similar processes for the combination of nitrogen and hydrogen under pressure. It represents a large energy cost in terms of total fuel used. It should not be forgotten, though, that the older Birkland-Edyde arc process depended upon the combination of nitrogen and oxygen to form nitric oxide or NO. This reaction runs best the higher the temperature and has to be run at temperatures above 2,000° C, followed by rapid cooling. It is just this high temperature that is rather directly attainable from nuclear fission, and a feature of atomic bomb explosions is the large clouds of nitrogen dioxide that appear. At the present time, though, no work of this nature using atomic energy in a controlled manner is under way. The matter of power, which is actively being pursued at this time, will be left with each of you to examine as you might wish.

The second potential interest of agriculture in atomic matters is in radioactivity or better penetrating radiation. This radiation is of three types: gamma radiation, which is essentially the same as X-radiation; beta rays or electrons which are negative particles; and the neutrons which were mentioned earlier as being uncharged. All of these have the common feature of being able to penetrate living materials and produce biological changes. The end biological change is death, and so we find these radiations being considered as means of sterilizing agricultural products or things of interest to agriculture. The development of the atomic energy program for the production of fissionable materials for military purposes gives large amounts of radioactive materials as by-products. So the levels of radiation now attainable greatly exceed values that might previously have been imagined.

Since penetrating radiations can kill things without much heating, they are of interest in problems of storage. Here the question is one of economy. By and large, the radiation will do the job of increasing the storage life of meat or vegetables and of killing insect infestations. The dosages are very high and small units of materials have to be treated. It would seem that the immediate promise here is in a specialty use such as the preservation of meats in conjunction with refrigeration or under drastic conditions of storage such as for long periods in the tropics as required by the army. There is really very little suggestion of competition with heating where it can be used, and many potential chemical procedures such as treatment with acromycin.

The most striking example of the use of radiation in agriculture has come from your field of concern, namely, insect control. Many of you are familiar with the control effected in the horn screw worm fly by R. C. Bushland, A. W. Lindquist, and E. F. Knipling, of the Agricultural Research Service, on the Dutch island of Curacao. Their work was based upon the fact that penetrating radiation can sterilize the pupae of the flies without interfering with their vigor and subsequent transformation to adult flies. The natural fly populations are not great and the female mates but once. If sterile flies are produced and liberated in numbers greatly exceeding the normal males, first matings will, by chance, be chiefly with sterile males. These expectations were realized, and at least for the restricted locality of an island such as Curacao have been successful.

The method can possibly be extended, and Dr. A. W. Lindquist, who was associated with the initial work on the screw worm fly, has pointed out to me that local infestations of some newly introduced insect pest might be cleaned up in this manner. Such a method is a very valuable one to have in reserve for insect control.

Agricultural interest in uses of penetrating radiation is also considerable in the field of genetic modifications. These uses depend, as did the screw worm fly control, upon the fact that germ plasm or nuclei of reproductive cells are far more sensitive to modification by radiation than are somatic or vegetable cells. The reason for this is that the chromosomes are unpaired and, therefore, modification need be effected only at one site and can be transferred by mating.

The rates of mutations can be increased and since much breeding rests, in part, upon these mutations radiation can be used to hasten the work. This has been done with regard to disease resistance of plants, in particular with oats, barley, and other grains by workers at Brookhaven National Laboratory and in Sweden and elsewhere. The burden of the work in breeding, however, is on the breeder more than on his devices, so radiation can chiefly be counted as another tool at his command. All modifications that the breeder might wish are not obtained by chromosome breakage alone.

The Radioactive Isotope

THIS brings us to the last aspect of atomic energy, namely, the radioactive isotope. The supply of isotopes for general use was developed by the Atomic Energy Commission immediately after 1946 as an aid to the scientific community. The isotopes under consideration are atoms of elements that differ from the normal ones by being radioactive. Because of the sensitivity with which radioactivity can be detected and measured, these atoms can be used as tracers for the regular atoms. Thus, the fate of any compound in a living system can be followed in detail. This possibility has revolutionized much of the knowledge of the pathways of biological synthesis.

A most striking accomplishment in the use of radioactive isotopes was in following the chemical pathway of carbon dioxide in photosynthesis by green plants as worked out by Calvin, Benson, Bassham, and their associates at the University of California. The reaction pathways discovered in this work have also proved to be important in sugar utilization by man. As your interest is in matters pertaining to insects, however, I will draw upon that field for illustrations.

Radioactive isotopes are used in two ways in insect control research work. The first is as biologically inactive markers and the second as materials to follow the changes of insecticides and the nature of their reactions with insects.

The flight ranges of mosquitoes, house flies, spruce beetles, and other insects have been found by radioactive marking. An example of this kind was the marking of wireworm beetles by an isotope of radium and the use of a small piece of radioactive cobalt placed in the body cavity of the wireworm larvae to trace their movements in soil.

This use of the radioactive isotope as a marker is also of value in finding the distribution of sprays and dusts. Such work must be done carefully to avoid radioactive contamination. I will state quite frankly, however, that the hazards to the worker arise as much from the insecticide or spray material as from any radioactivity used and these hazards, as you know, are low. The Atomic Energy Commission, in its efforts to avoid any hazardous use of radioactive materials, has stringent requirements for spreading them on the landscape.

In tracing the biological changes that an insecticide, fungicide, or plant growth regulating compound might undergo or in following residues of these materials, it is necessary to incorporate a radioactive isotope in the compound. This usually requires the work of a skilled organic chemist who must turn his chemistry around a bit to get high yields in terms of the radioactive component of the compound desired. Since carbon compounds are often of interest, the radioactive carbon atom of Mass 14, which has a half-life of thousands of years, can be used. Suitable isotopes are also available for phosphorus, sulfur, and bromine which are important components of insecticides.

The use of radioactive DDT can serve as an example. This has been prepared with Carbon 14 in the benzene rings and also a bromine analogue with bromine substituted for a hydrogen ring has been made. This use of bromine is necessary, since chlorine does not have a very suitable radioactive isotope.

It was by use of this radioactive DDT that excellent evidence was obtained that the compound can be degraded by insects and by soil organisms to the corresponding ethylene compound DDD. The degrading by soil organisms is important in that it shows that soil accumulation of DDT is not likely. The most important finding, though, is that the adaptation of insects to DDT is, in part, development of a reaction for detoxifying the compound. This method of study and this subject of insect adaptation to insecticides is, of course, of greatest financial concern to you.

The synergistic or extender materials such as piperonyl butoxide, for pyrethrins and other insecticides, were shown by use of radioactive carbon in the pyrethrin, to be effective, in part, by reduction of the detoxification of the active compound by the insect.

An important question facing your group is the course that the development of the systemic insecticides and systemic compounds toxic to mites will follow. The questions here are the nature and effectiveness of absorption of the compounds by plants, their distribution in plants, and finally their persistence in plants. Octamethyl pyrophosphoramid (OMPA), demeton-O, and demeton-S labeled with radioactive phosphorus have been followed in this way. All are slowly destroyed in the plant.

Following the fate of methyl bromide as a fumigant, I am sure will repay all the attention that has been given radioactive materials in insecticidal work. Here the important question in addition to the insect control is the fate of the compound in the grain or other treated material if these are intended for human consumption. Simple feeding experiments would not be too satisfactory to establish lack of toxicity in treated materials as witnessed by the long history of chlorinated amines in the bleaching of flour. With radioactive carbon and bromine, however, the very minute amounts of compounds formed with grain can be isolated, identified, and their individual toxicological features established. This is now in course of development.

In summary, you can see that at the moment "atomic energy" is valuable as a research tool in agriculture. The future of finding out more about the action of insecticides on insects with this research tool is very promising, but there is no evidence of such revolutionary changes as have accompanied introduction of the many new biologically active compounds in the period since 1940.★★

Fertilizer Amendments

By Vincent Sauchelli
Baltimore, Md.

Using Superphosphate to Limit Fixation of Manganese in Soils

EXPERIMENTS conducted in Germany* by Prof. A. Frühstorfer have led to the observation that normal granulated superphosphate and manganese sulfate when applied in combination as fertilizer materials reduce the fixation of manganese. The explanation given is that the manganese is rendered soluble and kept soluble by the acidity which develops in the zone of soil immediately surrounding the granules.

It used to be thought that manganese deficiency occurred in sandy soils having a definitely strong acid reaction; today it is recognized that such deficiency in light sandy soil does not occur at a pH below 6.0 but does occur beginning at pH 6.4. Thus the range in the degree of acidity affecting appearance of the deficiency is relatively narrow, and therefore the Mn deficiency can be reduced or even prevented if the pH is lowered as, for example, by the application of a suitable fertilizer.

Apparently manganese is rapidly fixed in the soil when the conditions are favorable and its deficiency is due more to this fixation by soil agencies than by absence of the element itself. Frühstorfer commented that it is useless to apply large quantities of a manganese salt with the idea of creating a reserve, because all the manganese may become fixed and unavailable.

The tests at the Oldenburg Station were designed to study the effect of a physiologically acid complete fertilizer (NPK) in general, and specifically the effect of a superphosphate-manganese sulfate mixture on the yield of oats. The complete fertilizer was formulated with sulfate of ammonia, superphosphate and potassium sulfate and was physiologically acid to the degree at which it could of itself keep manganese soluble. The results can be briefly summarized as follows:

(A) See Table below:

(B) Another series of tests at this same Station was carried out using the following treatments in addition to Nos. 1, 2, 3 & 4 above:

5. NPK, acid reaction, applied before seeding. The phosphorus (P) from superphosphate containing manganese equivalent to 6 kg/ha as the element Mn.

6. NPK acid reaction, topdressed; the P, same as in 5 preceding.

In tests 5 and 6 the superphosphate-manganese combination was a homogeneous mixture in which the manganese as sulfate comprised 5% of the total and both were in granulated form. The Mn present was in the ratio of 4 Mn to 1 manganese sulfate. The mixture was applied at a rate which provided 80 kg P_2O_5 and 6 kg Mn to the hectare (72 lbs. P_2O_5 and 5.4 lbs. Mn to the acre.) The relative yields in dry matter were as shown in Table at top of Page 43. The author concluded from these data:

A physiologically acid fertilizer in which normal granulated superphosphate furnished the phosphorus,

Fertilizer treatment	1st Test	2nd Test
1. NPK alkaline reaction	100	100
2. NPK + 25 kg/hectare Mn plowed in	160	158
3. NPK + 3 “ “ “ “	106	121
4. NPK + 4 “ “ sprayed	149	150
5. NPK acid, before seeding	119	118
6. NPK “ topdressed	111	119

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*Agric. Expt. Station, Oldenburg. Reported to Int'l. Super. Mfrs. Assoc. July 1955.

can limit the unavailability of manganese to a considerable extent.

By using a complete fertilizer which contains a mixture of superphosphate and manganese sulfate at a 5% rate, it is possible to get the same effects as with a much larger quantity of manganese when the latter is not combined with the superphosphate.

Plot No.	(as above) (B)	1st Trial		2nd Trial	
		Yield	dry matter	Yield	dry matter
1.	check	100	39.46	100	46.39
2.		178	70.30	134	61.97
3.		108	42.48	109	50.60
4.		155	61.08	128	59.35
5.		172	67.95	127	58.72
6.		183	72.10	120	55.73

Lime—the Neglected Factor

WHY is it that the application of lime to crop soils and grasslands receives so much less consideration by farmers than the other factors essential to a profitable operation? Is it because lime is relatively so much cheaper than say, fertilizer, or quality seed or irrigation? Surely the importance of proper liming of crop soils is no longer debatable and in fact is readily admitted by the great majority of farmers. Yet, why should liming be so much neglected when it is known that plant growth and the effectiveness of fertilizers depend so much on the right pH of the soils? This question of the current neglect of lime applications to cropland was discussed at a number of state fertilizer conferences last fall. But the discussions did not bring out a satisfactory answer, at least not at the meetings I attended. Many reasons were presented to explain the current status of liming. The most significant, it seemed to me, is that lime is not a profitable item to market. In some states the government sells agricultural lime at cost, which means of course that general farm supply firms will not handle it. Where the profit motive is lacking, enthusiasm and sales effort will be lacking, too.

Recent surveys made in most of the European countries have brought out the fact that, as in the humid regions of the United States, a very large proportion of the agricultural soils are deficient in lime. Also, that the amounts of lime usually applied are inadequate to compensate for annual losses, let alone for contributing to a reduction of the heavy lime deficits inherited from previous croppings and leachings. The total deficit of our American soils is tremendous. Under the Agricultural Conservation Program of the 40's American farmers did fairly well and applied about 26 million tons of limestone annually to our croplands. But at present the current annual rate is about 16 million tons. The government subsidy apparently was a big stimulus to liming. But at this rate it will never be possible to overcome the lime deficiency back-log. Yet it is a well-established fact that lime applied to deficient soils can bring about spectacular responses in crops as a result of the favorable pH and the consequent more efficient utilization of the applied chemical fertilizers. In Missouri, just to cite one typical example, when farmers were being subsidized by the Soil Conservation Program, liming went from a low of 60,000 tons to a peak of 3,700,000 tons per year. The optimum annual goal set up for the State by local agencies amounts to 5,500,000 tons.

Farmers having acid soils should lime them if they expect to operate their farms profitably. Liming is the first important step in the improvement of soil fertility and physical condition. When lime is applied in accordance with crop needs as determined by a soil test, a return of from $5 to $10 per acre for every dollar invested may be expected. This return is measured by higher yields and better quality brought about by the more efficient utilization of the applied fertilizers.

The following is a brief list of beneficial effects from liming acid soils:

a. Liming to a pH of 6.5 to 7 releases soil reserves of phosphorus and keeps the applied fertilizer phosphate available to crops for a longer time. This effect alone is worth all the cost of the applied lime. The chemical and microbial reactions induced in the soil by the lime also promote the change of organic nitrogen to the nitrate form which, being soluble, can be utilized readily by the crop.

b. Liming with dolomite furnishes, at low cost, two nutrient elements, calcium and magnesium. These elements are absolutely necessary to a plant for its best growth and the production of seed.

c. Liming acid soils creates an environment favorable to the soil microbes. A thimbleful of soil contains a greater number of bacteria than the number of people on earth. Some of these bacteria are good, others bad for crop life. Liming favors the good kind.

d. A strongly acid soil causes the accumulation, in soluble form, of aluminum, iron and manganese and the suppression of phosphorus and molybdenum. An excess of aluminum is toxic to plants. Liming neutralizes the acid and thereby reduces the accumulation of poisonous free alumina.

e. Liming improves soil structure by promoting the formulation of a granular, crumb-like structure. Such improved texture permits the entrance and easy circulation of air and water through the soil mass which is so beneficial to the development and expansion of root systems.

f. Liming assures the growth and vigor of alfalfa and other desirable legumes. Alfalfa grown on well limed and fertilized soil lasts longer and will produce annually 3 to 5 tons of high

(*Continued on Page* 123)

Agricultural Chemicals . .

AGRICULTURE today, with its high degree of technical knowledge, mechanization, and specialization is just as truly an industry as are other forms of manufacturing. Just as industry is turning to automation, so has the farmer turned to mechanization. It may still be true that the individual farmer does not himself possess all the technical know-how that he may need, but through his industry representative, county agent, or extension worker, this information is readily available.

Agriculture, in spite of, or maybe because of, vast surpluses, is intensely competitive. The individual farmer must grow the maximum possible yield per acre of the best quality crop at the lowest possible cost to avoid sinking into debt. Chemicals help him achieve all three of these aims by protecting his crop and by cutting his labor costs. The government will continue to demand cleaner products and the public more eye-appealing ones. The farmer's problems of quality are rapidly becoming as difficult as those of the automobile manufacturer or television producer.

In selecting the title for this report, we attempted to find one that adequately expressed the problems as well as the promise of the agricultural chemical industry. "A Teen-Ager Growing Up" seemed to encompass both these aspects. A teen-ager is characterized by being in his most rapid period of growth and change, and the agricultural industry (we are purposely excluding fertilizers from this discussion) qualifies on this basis. Since 1939, the industry has grown from $40 million to $200 million of sales. In 1939 there were approximately 50 basic products and now there are more than 200. According to the Manufacturing Chemists Association, between 80% and 90% of today's sales are in products not on the market 12 years ago. The first of the new organics sold on the civilian market were:

Chloranil	1940
Ferbam	1943
DDT	1945
2,4-D	1945

Growth in the years ahead will be equally as rapid for the next decade. Losses due to *weeds, diseases* and *insects* are each about $4 billion per year. In spite of available control measures, experts estimate that the total losses due to all causes are $15 billion. At least a large portion of this loss is potentially controllable by agricultural chemicals yet to be discovered. At the present rate of growth (8% per year, MCA), agricultural chemicals sales should reach $1 billion a year by 1975.

The cost of research and development of an agricultural chemical is an oft-told tale. Based on our own experience and from discussions with such concerns as duPont, Dow, American Cyanamid, and Rohm & Haas, we feel that the following example is representative and may be conservative. To obtain one successful agricultural chemical about 1,800 compounds must be synthesized and run through biological screens. On the average, it costs $150 to synthesize a chemical and $200 to run it through biological screens. Our initial research cost is then a total of 1,800 *compounds in each of which* $350 *is invested.* Only one in 30 of these compounds survives the initial screening, and the cost of the failures must be borne by those that continue. A total of $10,500 is therefore invested in each of the remaining chemicals. Further laboratory and greenhouse work will cost $1,000 each, making a total of $11,500 for each chemical. Only one chemical in ten will merit further consideration. In each of these (adding the cost of failures), $115,000 is invested. Initial field tests will cost at least $1,000 per chemical which must be added to the $115,000. Only one in three of these compounds will be worth a full-scale development effort. So there remain two chemicals that have cost so far $347,700 each. To this must be added the $250,000 developmental cost, which is made up of field studies, analytical methods and residue analyses, toxicological studies, production, research and pilot plant construction, and costs of securing patents. The total cost of each of the two remaining chemicals is now approximately $600,000. If only one of the two compounds achieves commercial markets, the full price tag will read $1,200,000.

At this cost, no company with a fully co-ordinated agricultural chemicals program can remain long in the field if it cannot so plan and execute its merchandising that it will not only recapture its research investment but also obtain the rewards in profits that its risk and enterprise justify. Bear in mind that the cost of research applies only to the actual testing of compounds for activity in well-defined areas of application. In addition, the expenditure of funds and effort is needed in other fields of "blue sky" research. The mechanism of action of chemicals, their effect on growth, flowering, fruit yield, and many other questions of a like nature await an answer. Such information will enable us to supply the farmer with even more potent, specific, and safer pesticides — and the new and improved aids in the future. Work of this nature is expensive, time consuming, and is likely to bear fruit only many years after its initiation. Unless agricultural chemicals are a profitable business, there is no incentive for a company to embark on such a program.

We are thoroughly aware of the role that government research already plays in this field. Industrial research is only one part of the team that will

a teenager growing up

*by J. A. Field and R. H. Wellman**

Carbide and Carbon Chemicals Corp.
New York

increase our knowledge in the years to come. This team is pulling together remarkably well. Yet at the present time, governmental research is primarily directed toward stages of investigation later than synthesis or primary screening. There are 10,000 new organic chemical compounds being synthesized each year by industrial laboratories. The pesticidal value of each of these should be determined and adequate synthesis programs built around the promising compounds. Unfortunately, no one has yet been able to predict with certainty the exact chemical that will accomplish a desired biological result. The screening and early testing of these compounds is industry's responsibility. If industry does not live up to this responsibility, the farmer will suffer — because discoveries are not made. And yet, to exist, an industrial corporation must return a profit even as the individual farmer must. If the corporation sows the seeds of research, it also must be able to reap a reasonable harvest. All of this means that any program carried out by an industrial concern must be a sound one. It is equally necessary that all those who play a part in the program from the research chemists through to the farmer understand and appreciate the complexities of development and marketing an agricultural chemical. Let us consider the activities immediately following a research testing program: process development, pilot plant studies, and adequate engineering.

Process Development and Pilot Plant

PROCESS development is necessary to find how the product can be made most economically — first in the pilot plant and finally in the large-scale plant. Process development should begin as soon as a new pesticide shows promise. Samples are required for field testing until the product is ready to be moved into the pilot plant. The pilot plant satisfies two major requirements in the early stages of the development of a new pesticide. It supplies quantities of the product for sales development purposes and operating data for the design of large-scale plant.

Engineering is necessary for the design, erection, and initial operation of the most economical plant. For the engineering department to arrive at such a plant, they must be brought into the picture early in the development of a new pesticide — when it appears to the biologists that the product has promise of becoming a commercial material. Our own engineering department prepares a "Liaison Report" at this stage, which furnishes rough estimates of costs and return on investment at estimated sales prices and volumes. We find this service invaluable in determining whether we are in the right "ball park." It would be folly to continue pouring money into a prospective agricultural chemical — or any other chemical — if the economic outlook were hopeless. However, considerable judgment must be exercised. The engineer — with his sharp pointed pencil — must not be too quick to discourage the imagination of the biological researcher.

As development of the new agricultural chemical continues, proper engineering tightens cost estimates through more detailed design work. We follow our "Liaison Reports" with a "Preliminary Outline of Project." This is much more detailed than the "Liaison Report" and represents the first real pencil sharpening from an engineering viewpoint. When it is time for management to decide on the appropriation for the multi-million dollar plant required to manufacture the new pesticide, the economics will have been pinned down within narrow limits. For this, our engineering department prepares a very detailed "Construction Budget Request."

Concurrent with the later stages of research and the engineering and erecting of suitable production facilities, market development must progress. The steps involved are shown in the table and are discussed in detail in the paragraphs following. Although we discuss these steps individually, they do not necessarily proceed consecutively. Indeed, the essence of success is to have them proceed simultaneously so that all steps are complete when the product is ready for full scale sale.

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*Presented at the NAC meeting, Hollywood, Fla., March 14, 1956.

1. Market Study
2. Timing
3. Physical and Chemical Properties
4. Formulation
5. Biological Activity
6. Product Specifications
7. Toxicological Data and Residues
8. Labeling
9. Patent Considerations
10. Advertising and Publicity

Market Study

IT may seem obvious that a market study is necessary before the market development of any chemical is undertaken. Nevertheless, it is surprising how often the natural enthusiasm of a sales group may cause a large number of people to waste their time and effort on a project that prior careful consideration would have doomed from the start. For example, suppose a compound has been found which is specific for the control of mint rust and that disease alone. The chemical is effective at the rate of one pound per acre used once. Such a product would be valuable indeed to the growers of mint. In 1953, there were 37,000 acres of spearmint grown and 18,850 acres of peppermint grown. Conceivably every acre in the country could be treated and perhaps the chemical might sell for a gross profit of 50 cents a pound, although this is a very optimistic margin.

When the development and selling expenses are considered, when a comparison is made between spending technically trained people's time and energy on this development rather than elsewhere, it is immediately obvious that it could never be worthwhile for the maximum gross profit of $25,000 a year. Or we could have a chemical with a plant cost of 35 cents a pound which must be compared with chemicals that are already established for the use and sell for 35 cents a pound. These cases are absurd extremes but they clearly highlight the facts of life as applied to developing a market for agricultural chemicals. Not only must the actual extent of market available be determined, but also the necessary selling price, the cost of manufacture, raw material availabilities, and capital investment cost required to build facilities for the production must be considered. At least a qualitive and careful estimate of these factors should be made before reaching the decision to undertake the serious development of any agricultural chemical.

Timing

ONE question frequently asked is "When should a new agricultural chemical be introduced to the farmer?" In general, the answer is "As soon as possible." This means as soon as its effectiveness and its safety are established, sufficient facts are amassed to give intelligent directions for use; to avoid handling hazards; and to avoid excess residues; and the formal requirements of the Miller Bill and the Federal Insecticide Act have been satisfied. Usually this also means not until experiment station personnel have had the opportunity to evaluate the material under their own conditions. Yet it is unfair to have experiment station people spend their time evaluating a new material unless there is reasonable assurance that it will be made available to growers if successful. No publicity or advertising should be undertaken until sufficient evidence is at hand that the product can be produced at a low enough cost to meet the requirements of the intended use. Common sense requires that the introduction of a new chemical cannot precede the ability to supply such chemical in reasonable quantities.

The development of an agricultural chemical is at best a slow process. The period varies from five to fifteen years, with the average over seven years. A short delay at the beginning while you get "your ducks lined up" is apt to pay off in quicker progress from then on, with less irritation to all concerned. Proper timing must take into consideration all the points enumerated.

Objective is to reach the farmer at the earliest possible moment consistent with these criteria. Each year that can be cut off the time necessary for development of an agricultural chemical is really important. The interest on a $1,000,000 investment for one year is $50,000. Getting a chemical to market a year earlier not only saves this but starts returning the total investment sooner. The companies that can conduct agricultural chemicals development surely and swiftly have a great advantage over those that cannot.

Physical and Chemical Properties

AS soon as it has been determined that a development program is desirable, the physical and chemical properties of the new chemical must be studied to the maximum extent consistent with economy. In particular, every property that affects the safety of workers or handlers, such as vapor pressure, skin irritation, flash point, and explosive limits, should be determined. In general, our custom has been to determine the physical properties before any large-scale development program is undertaken.

Formulation

FOR agricultural chemicals a proper formulation often determines the success or failure of a chemical. It may be a wettable powder, an emulsifiable concentrate, or some other form. The formulation must be easy to use, concentrated enough to be economical, and designed to get the chemical to the site of action in the most efficient form.

Carbides' Crag DCU 73 W, which is being sold this year for sugar beet weeding in the west is an example of the importance of formulation. DCU was first formulated as a dust, but when we got it fine enough to flow freely it was so fine that the least wind would blow it away. We then turned to a wettable powder that is sprayed on the soil, and this slight change made the difference between failure and success.

An agricultural chemical must be stable in storage for periods of a year or longer, must not be affected by extremes of temperature from below 0°F. to above 100°F., and must neither separate nor block during storage. We learned this necessity to investigate blocking the hard way. One of the products we produced was a white, free-flowing powder when it left our plants — but white, 50-pound chunks of concrete six months later. A quick study showed that the addition of minor amounts of an anti-blocking agent effectively prevented this condition. We have had no further trouble but by not investigating this property in advance we were held up in development at a critical period and caused ourselves a great deal of unnecessary trouble and expense.

Containers and container weights, although not strictly classified as physical properties, must be determined early in the development program. This would include the size and type of container, whether glass, stainless steel, plain iron, or resin-lined. Those of you who have not adequately investigated bulk density of your new product and its variability may have had the experience of being unable to get two pounds of material in a five-pound container.

With regard to chemical properties, a thorough literature survey is made and this is combined with information developed in our own laboratories. The more significant chemical properties are selected for inclusion in technical literature subsequently prepared.

Biological Activity

FROM our research experience we must compile data to determine the pests against which our chemical is effective. What dosage should be used? What is the proper timing of applications? On what crops can it be used safely? What are the effects of temperature, light, rain, other climatic conditions, and soil type and fertility on its effectiveness? What are its compatibilities with other pesticides that may be used in conjunction with it? What are its limitations? All these facts must go in the technical information sheet and will be the basis of all subsequent development.

Product Specifications

THESE are limits that guarantee the physical and chemical properties of the product will be consistent from one shipment to another. They must be set to exclude any chemicals undesirable from a residue standpoint, and to guarantee uniform performance. They must also be lenient enough to permit economic production of the chemical. They can be tightened as experience is gained in production.

Toxicological Data and Residues

YOU are all familiar with the difficulties and expenses which have always been involved in obtaining sufficient data of this type and you also know that they must be obtained. The added impact of the Miller Bill on agricultural chemicals has been discussed by many people and is foremost in the thoughts of the agricultural chemicals industry. Today the fact is that analytical work in developing residue methods and the subsequent residue tests together with the necessary toxicological work may well add $100,000 to the cost of an agricultural chemical.

Labeling

ALL the claims we make about our agricultural chemicals must be very carefully handled. First, they must be the truth, then they must be *all the pertinent truth,* and finally they must be the truth in language the farmer understands. It is in this last phase that we frequently fall down. We must say what we mean simply, clearly, concisely, and forcefully. Incidentally, one of our most serious responsibilities is to have our labeling so worded that a farmer following our directions will not end the season with a crop having a residue in excess of that allowed.

At Carbide and Carbon, a labeling committee has been established composed of representatives from the industrial sales, toxicological, law, advertising, and safety codes departments, in order to give our customers a full and frank statement about the chemical. It is our aim not merely to stay within the letter of the law but to render our customers real service by providing all the pertinent information we can.

Patent Considerations

GOOD patent protection provides a few years of exclusive sales, during which time process know-how can be fully developed and the company name and trade-mark can become closely associated with the product (As an aside, you are aware of the difficulties of losing a trademark through common use to the extent that the trade-mark becomes the product name.) In a field where the preliminary investment is as high as it is in agricultural chemicals, adequate attention to obtaining patent protection is vital in recouping the research costs. Obtaining adequate patent protection can itself be time-consuming and should be started as early as possible so that the further development of the pesticide will not be held up.

Advertising and Publicity

WHEN it comes to advertising and publicity, I seriously wonder whether we realize its fundamental purpose. The easy answer is: "to sell materials." But its purpose is not to sell materials only once — rather publicity and advertising should build a market. We must teach in our advertising. Our customers, the farmers, are intelligent, interested, busy businessmen. But they may not all be experts in entomology, plant pathology, or plant physiology. Let's take an example from the field of herbicides. Suppose you are a peanut grower and have hoed and plowed peanuts all your life, just as your dad and his dad did before him. We sell a product Crag Herbicide-1 — that is useful in weeding peanuts. Suppose you, as a farmer, see an ad that says: "Now you can weed with Crag Herbicide-1?" What reaction would you

(*Continued on Page* 121)

RYANIA 100% for control of sugarcane borers

By Donald T. Starr
Trinidad Ryania Corporation
Upper Montclair, New Jersey

THE extensive work of Dugas, Concienne, and others (1) of the Louisiana Agricultural Experiment Station has established 40% ryania as a practical control of sugarcane borer, *Diatraea saccharalis* (F). Considerable amounts of the early experimental work were also done at the U. S. D. A. Experiment Station at Houma, La. by Ingram and his co-workers (2,3). One of the reports of Ingram and Bynum mentioned that 5 pounds of undiluted ryania per acre gave only slightly poorer control of first generation borers than 10 pounds of 40% ryania. Against second generation, the undiluted ryania was somewhat better than 40% ryania.

The use of 100% ryania which is designed for dusting without the addition of an inert diluent should be less expensive than the 40%.

The cost of the diluent and the cost of mixing would be eliminated. There would be some saving in freight, and although the dusting cost per acre would probably be almost the same, there should be some saving since fewer pounds of dust would be transported by the airplane.

On the basis of 5 to 7 pounds of 100% ryania per acre per application in place of 10 to 14 pounds of 40%, more actual ryania would be applied per acre, but at prices quoted in 1955 there would be a saving of 50 cents to one dollar per acre for the insecticide used in four applications.

Full scale tests were needed to determine whether the airplane application of 5 to 7 pounds of 100% ryania was equivalent to 10 to 14 pounds of 40%.

Experiment

The cooperation of A. L. Dugas and E. J. Concienne of the Louisiana State University and Agricultural Experiment Station in arranging the experiment is gratefully acknowledged, but this does not suggest that the application of 100% ryania is recommended by them or by the experiment station.*

The experiment was run in the vicinity of Franklin, Louisiana, with the excellent cooperation of M. L.

Editor's Note:

*Recommendations of the Louisiana Experiment Station for the control of sugar cane borer are covered fully in a bulletin "Sugar Cane Insect Investigations 1955" by Alvan L. Dugas,, E. J. Concienne and L. Sibley dated March 13, 1956. For control of first generation sugar cane borers, they recommend either undiluted cryolite (synthetic or natural) or 40% ryania at the rate of 10 to 12 lbs. per acre per application." For second generation borers, they recommend "either 40% ryania or undiluted cryolite at the rate of 12 to 15 lbs. per acre per application, or 70% cryolite at 15 to 19 lbs. per acre per application." They indicate that ryania is more effective than cryolite against second and third generation borers. For third generation borers, they suggest "40% ryania at the rate of 12 to 15 lbs. per acre per application. Cryolite is not recommended." Insecticides other than cryolite or ryania "are not recommended because they have not given comparable control, and may even account for an increase in borer infestation because of their toxic effect upon natural enemies of the borer." The 100% ryania at low dosage rates is not recommended, "since there is not sufficient data to support such a recommendation."

Marquette, Emitt Arboneaux, H. A. Thibodeaux and many members of the staff of the Oaklawn Division of the Southcoast Corp.

Five varieties of plant cane were used in the experiment. They were Canal Point varieties 29/116, 36/13, 43/9, 44/101 and 44/155. No treatment was applied for first or second generation sugarcane borer. The applications of experimental materials were timed according to the recommendations of E. J. Conscienne to combat the third generation.

Experimental Design

A randomized block design was used with 9 blocks of three plots each. A full square of sugarcane was considered as an experimental plot. The plots ranged in size from 1.33 acres to 3.0 acres with an average width of about 160 feet. Each plot or square was a separate unit separated by head lands and drainage ditches from the other squares.

There were duplicate insecticide treatments for each of the five varieties except for the 43/9 which had only one plot per treatment, so that there were a total of nine individual comparisons between each of the insecticide treated plots and the untreated plots.

Insecticide Applications

The recommendations for 1954 (1) indicate 4 applications of 12 to 15 pounds per acre of 40% ryania. In this experiment, 40% ryania was applied at 14 pounds per acre and 100% ryania was applied at 7 pounds. Untreated check plots were distributed at random beside the dusted plots. Small amounts of dust may have drifted into the untreated plots, which would result in slightly reduced differences between dusted and undusted plots.

The 40% ryania was a commercial product purchased by the Southcoast Corp. As for the 100% ryania, the wood was obtained from Trinidad in the British West Indies and ground for this experiment. Samples of both materials were bioassayed twice and found to be of good quality. An average commercial lot of 100% ryania was used as a standard and the average of two tests for the 40% ryania showed 51% of the standard. The Trinidad ryania 100% averaged 119% of the standard.

Donald F. Starr

TABLE I

Comparison of 100% Ryania Applied at 7 Pounds per Acre, With 14 Pounds of 40% Ryania for Control of Third Generation Sugarcane Borers in Plant Cane. No Treatment for Second Generation.

Dusts Applied by Airplane at the
Oaklawn Division of the Southcoast Corporation
Franklin, La.
August 16 to September 6, 1955

Averages of Duplicate Plots for Each Variety

Insecticide Treatment	Canal Point Variety	Acres Treated	Cane Tons per acre	Sugar pounds per ton	Sugar pounds per acre	Cane Tons per acre	Sugar pounds per acre
Ryania, 100% 4 applications one week apart	44/155	4.50	31.3	195	6115	3.3	690
	44/101	3.46	18.7	178	3330	—0.2	265
	29/116	5.09	24.4	164	3995	3.6	530
	36/13	4.53	34.1	171	5840	4.8	710
	43/9(a)	2.10	35.5	141	5000	3.5	300
Ryania, 40% 4 applications one week apart	44/155	3.59	29.5	193	5685	1.5	260
	44/101	3.33	14.5	172	2500	—4.4	—565
	29/116	4.26	19.2	153	2945	—1.6	—520
	36/13	4.83	32.5	178	5785	3.2	655
	43/9(a)	2.50	27.9	146	4070	—4.1	—630
Untreated Check	44/155	4.20	28.0	194	5425		
	44/101	2.69	18.9	162	3065		
	29/116	3.76	20.8	167	3465		
	36/13	4.00	29.3	175	5130		
	43/9(a)	2.20	32.0	147	4700		

(a) Indicates single plots.

White flags on long poles were placed at each end of the strips dusted with ryania, 100%; orange flags marked strips for 40 % ryania. Since the flags could be seen easily from the air they eliminated the possibility of the pilot applying dust in the wrong locations.

The pilot was Donald Roane of Jeanerett, La.

Four dust applications were made a week apart beginning on August 16, 1955. The dusts were applied in the morning between 6:30 and 7 o'clock.

After the pilot delivered a test load to calibrate the duster, there was no more difficulty in distributing 7 pounds per acre of 100% ryania than dusting 14 pounds per acre of 40%. Even though 7 pounds per acre is a small amount of dust, the ryania, 100% could easily be found on the foliage after dusting. Some could still be found 6 days later.

Results

Counts of bored joints were made in October by E. J. Concienne and any reports on this phase of borer control will be made by A. L. Dugas and E. J. Concienne.

The sugarcane in the test plots was harvested December 13 to 19 according to modern commercial practice. Weight records were kept on

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each plot and random samples of 20 stalks of cane were taken for routine sugar analyses, based on Brix and polarization readings. The standard error of sampling for sugar analyses amounted to 5% of the sugar calculated, whereas the standard error of the cane yields was 13%.

The available sugar per ton was calculated assuming 75% normal juice extraction and a boiling house efficiency of 97% along with the Prinsen-Geerlings formula (5). Sugar per ton = 2000 x 0.75 x 0.97 x S (1.4 — 40/P), where S is the sucrose content and P is the purity of the normal juice.

The results are recorded in Table I which shows the acreage, tons of cane per acre, and the calculated pounds of sugar per acre.

The overall averages are summarized in Table II along with the minimum significant differences, at a probability level of 5%, which were calculated from the standard errors obtained from the analyses of variance.

TABLE II

Averages of Nine Plots for Each Insecticide

Insecticide	Tons of cane per acre	Increase over check	Pounds of Sugar per acre	Increase over check
Check	25.1	—	4320	—
40% Ryania	24.3	—0.8	4210	—110
100% Ryania	28.0	2.9	4840	520
Minimum Significant difference	3.2		438	

The high yields of sugar per acre which resulted from good soil and moisture in combination with improved varieties of canes show up the effect of the insecticides better than the overall averages. Those averages are summarized in Table III.

TABLE III

Averages of High Yielding Canes 44/155 and 36/13

Insecticide	Tons of cane per acre	Increase over check	Pounds of Sugar per acre	Increase over check
Check	28.6	—	5280	--
40% Ryania	31.0	2.4	5740	460
100% Ryania	32.7	4.1	5980	700

Discussion of Results

The results in Table III show that improved varieties of sugarcane which are grown under good conditions of soil fertitlity and moisture yielded over 500 pounds of sugar per acre without the use of any insecticide. The application of ryania insecticides showed the best returns in increased sugar where yields were already good. This seems particularly significant for 1955 because yields were generally good in spite of the fact that many did not dust for sugarcane borer. Actually, good yields would have been even better if second and third generation borers had been controlled according to the recommendations of the Experiment Station.

In Table III the increase due to the application of 40% ryania was 460 pounds of sugar per acre, which is in good agreement with an increase of 498 pounds reported by Dugas and his co-workers (1) in 1954 where third generation borers were controlled with 40% ryania.

The average increases observed where 100% ryania was applied in the high yielding canes were 4.1 tons of sugarcane per acre and 700 pounds of sugar per acre.

The average of all nine comparisons in Table II showed that the yield of sugar from the plots dusted with 100% ryania was greater than either the untreated or the plots treated with 40% ryania. The increases due to 100% ryania were statistically significant which means that even though there is a variation in yield from square to square, the odds are greater than 19 to 1 that the difference in favor of 100% ryania is *not* due to accidental selection of the best squares for dusting the 100% ryania.

The 100% ryania dust was ahead of the 40% ryania on each of the five varieties included in the test which is not surprising when it is recalled that actually more ryania was applied per acre. Dugas and others (1) showed in 1950, 1952 and 1954 that heavy applications of 40% ryania gave greater increases in sugar than the recommended dosage.

The use of 100% ryania for control of sugarcane borer is merely a modified method of application of an insecticide which has been used successfully in Louisiana for 10 years. During the testing of ryania it has been applied in many different ways, and in every case there was an advantage for the plots treated with ryania. Ryania has been tested at concentrations of 20, 25, 30, 40, and 50, and 100 percent. The 40% ryania has been tested at 5 to 20 pounds per acre, and one test with as high as eight 12-pound applications of 40% was made for second and third generations.

Conclusions

Since a full scale test with ryania, 100% dusted by airplane gave good increases in yields of cane and sugar, a reasonable degree of borer control must have been obtained.

The possibility of reducing insecticide costs by the application of 100% ryania warrants wider investigation.★★

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(*Turn to Page* 127)

1955 Fungicide Tests - Part 2

Conclusion will run in June, AC

Lemons. A comparative rating of fungicides tested for Phytophthora brown rot control in California is presented in Table 19. Best results were obtained with Robertson's fungicide plus lime and with zinc and copper sulfate plus lime.

SHOT-HOLE. Bordeaux mixture (10-10-100), Zerlate (2 lb.), and Orthocide 50W (2 lb.) were applied to almonds at "bud swell," "popcorn," "40-60% blossom," and "petal fall" stages in one test for fungicidal control of shot-hole. Best control was obtained with Zerlate, and poorest control with Bordeaux mixture. Currently, Orthocide 50W is recommended for grower use.

In one test (13) eradicant spray materials were used in one dormant stage application to eradicate overwintering inocula of the scab and shot-hole disease pathogens. Coromerc (2.5 lb./100 gal.) gave better control than either Sinox General 1 qt.) or Dow Dormant (8 lb.)

TABLE 19

Ratings of fungicides applied once in mid-November for control of Phytophthora brown rot of lemon in California (3).

Fungicide	conc./100 gal.	Ratings[a] Disease control	Phyto-toxicity	Experimenters' preference
Robertson's plus lime	0.75 lb.-2.25 lb.	1	2	1
Zn and Cu sulfates plus lime[b]	3-2-6	1	2	1
Bordeaux[b]	3-4.5	1	3	1
Bordeaux[b] plus duPont SS	3-4.5-⅛	1	4	2
Bordeaux[b]	3-3	2	5	3
Ortho pwd. Bordeaux (12.7% Cu)	6	3	3	3
Copper A lime plus lime plus SS	1.5-2.25-⅛	4	4	3
22% Copper Bordeaux plus lime	3-1.5	6	3	4
Orthocide (50-W)	2	7	1	4
Ortho Cop 53	1.5	5	6	5
Manzate	2	8	1	6
22% Copper Bordeaux	3	5	8	7
Robertson's	0.75	6	9	8
Tribasic copper sulfate	1.5	9	7	9

[a] Best performance indicated by lowest numbers.
[b] Tank mix.

Foliage Sprays and Dusts

(*Concluded*)

Ornamental Plants

Fungicides tested for control of diseases of ornamental plants and turf grasses are listed in Table 20.

Carnations. Any of 3 fungicides, zineb, maneb, or captan, is recommended for Alternaria leafspot control in New York (40). Fungicides containing captan give good leafspot control, but are inferior to zineb and maneb as regards carnation rust control. Results of the 1955 trial for carnation leafspot control are given in Table 21.

Roses. Blackspot was controlled most effectively in New York (42) by maneb or zineb, with or without Karathane. In a test where fungicides were applied 19 times at weekly intervals, materials containing maneb or captan performed better than did those containing ferbam. Thylate performed poorer than did ferbam mater-

(*Turn to Page 57*)

TABLE 20

Fungicides tested for control of diseases of ornamental plants and turf grass.

- Acti-dione
- captan
    - Captan 50-W
    - Orthocide
- copper oxysulfate
- ferbam
    - Fermate
- glyodin
- J. & P. Rose Dust
- J. & P. Rose Spray
- Karathane
- maneb
    - Dithane M-22
    - Manzate
- Mathieson 1456
- Mathieson 1563
- Niagara ME 5337 Rose Dust
- Niagara ME 5338 Rose Dust
- Niagara ME 5339 Rose Dust
- Omazene
- Puratized 1122
- Puratized 1143
- Puratized 1180
- sulfur dust
- Thylate
- USDA Experimental Rose Dust
- Vancide F1565W
- zineb
    - Dithane Z-78

TABLE 21

Percentage control of Alternaria leafspot of carnations by fungicides that had been applied 10 times at weekly intervals.

Fungicide	conc./100 gal.	Percentage disease control[a]
zineb[b]	1 lb.	89
maneb[b]	1 lb.	90
captan[c]	2 lb.	89
Puratized 1122	1.5 lb.	95
Puratized 1143	1.5 lb.	90
Puratized 1180	1.5 qt.	91
Vancide F1655W	1 lb.	54
ferbam	1 lb.	61
Mathieson 1563	0.5 lb.	50
Mathison 1456	0.5 lb.	32

[a] Nonsprayed plots rated as 0 per cent disease control.
[b] First choice.
[c] Second choice. Not effective against carnation rust.

TABLE 22

Blackspot of rose disease ratings made in plots that had been sprayed or dusted 19 times (42).

Fungicide	conc./100 gal.	Blackspot rating[a]
Manzate plus IA[b,c]	1.5 lb.	35
Manzate plus Karathane[c]	1.5 lb.; 0.5 lb.	37
Dithane Z-78 plus IA[c]	1.5 lb.	43
Z-78 plus Karathane plus IA[c]	1.5 lb.; 0.5 lb.	43
Dithane M-22 plus IA	1.5 lb.	50
Niagara ME 5337 dust[d]	—	55
M-22 plus Karathane plus IA	1.5 lb.; 0.5 lb.	58
USDA Exptl. dust[e]	—	63
ME 5338 dust[d]	—	74
M-22 plus Karathane plus IB[f]	1.5 lb.; 0.5 lb.	76
M-22 plus captan plus IA	0.75 lb.; 0.75 lb.	78
Fermate plus IA	1.5 lb.	80
J. & P. Rose Dust	—	83
ME 5339 dust[d]	—	88
J. & P. Rose Spray	4.5 lb.	89
Fermate plus Karathane plus IA	1.5 lb.; 0.5 lb.	90
captan plus Karathane plus IA	2 lb.; 0.5 lb.	95
captan plus IA	2 lb.	96
captan plus Karathane plus IB	2 lb.	97
J. & P. Rose Spray	4 lb.	113
Thylate plus Karathane plus IA[g]	1.5 lb.; 0.5 lb.	117
Thylate plus IA[g]	1.5 lb.	126
none	—	165

---

[a] Sum of weekly ratings made as follows: 0, no blackspot infection; 1, from 1-10 spots/plant; 2, 10-30 spots/plant or lower half of plant badly infected; 3, more than 30 spots/plant—entire plant badly infected; 4, defoliation resulting from blackspot.

[b] Insecticide A: 1.35 lb. 75% DDT wettable powder, 1 lb. 15% Aramite w.p., 0.15 lb. vat soluble OTB, and 0.27 lb. Lindane w.p.

[c] Significantly better than ferbam. Differences within group not significant.

[d] Slightly phytotoxic.

[e] Severely phytotoxic.

[f] Insecticide B: 1.5 lb. 50% DDT w.p., 2 lb. 25% Malathion w.p.

[g] Poorer than ferbam.

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TABLE 23
Control of blackspot of roses in Maryland (31) with fungicidal sprays applied 16 times at weekly intervals.

Fungicide	conc./100 gal.	Blackspot disease control rating[a]	
		7/29/55	8/19/55
ferbam[b]	2 lb.	6.14	5.08
zineb[b]	2 lb.	6.69	5.64
Omazene[c]	2 lb.	5.90	2.21
glyodin	1.5 qt.	4.20	2.02
captan	2 lb.	6.39	3.07
none	—	3.30	1.46

[a] Average ratings, where 0 is no control and 10 is complete control. Twelve in. rainfall recorded between the 2 observation dates.
[b] Recommended for grower use.
[c] Copper toxicity noted 7/29/55.

TABLE 24
Control of blackspot and flower yields in plots of Golden masterpiece roses grown in Maryland (31) and dusted 16 times at weekly intervals.

Dust	Blackspot disease control ratings[a]		Pounds of flowers
	7/27/55	8/24/55	
none	3.05	3.21	24.6
copper oxysulfate (3.4%)[b]	5.25	6.69	35.3
copper plus 25% sulfur[b,c]	5.96	7.72	86.9
ferbam (7.6%) plus 25% sulfur[c]	6.64	7.85	83.2
captan (50%)	4.44	5.21	52.2
Karathane (1%)	3.58	3.25	24.8

[a] Average ratings, where 0 is no control and 10 is complete control.
[b] Copper injury observed.
[c] Recommended for grower use.

TABLE 25
Performance of fungicides tested for control of Cercospora leafspot of Roses in Texas (56).

Fungicide[a]	conc./100 gal.	Wt. of 10 bushes	Experimenter's preference
		lb.	1 = best
Stauffer sulfur-copper (90:10) Rose Dust [b,c]	—	5.6	2
captan (4%) dust	—	3.9	6
captan (7.5%) dust	—	3.7	7
maneb (8%) dust[b]	—	4.5	4
captan[b]	2 lb.	4.6	3
maneb[b]	1.5 lb.	6.1	1
Omazene	1 lb.	4.2	5
none	—	2.9	8

[a] Applied 13 times; weekly, May 4-July 6; biweekly, July 6-Aug. 17.
[b] Recommended for grower use.
[c] Foliage injury in hot weather.

TABLE 26
Ratings of fungicides tested in New York (40) for control of snapdragon rust.

Fungicide	conc./100 gal.	Percentage disease control	Experimenters' perference
Dithane Z-78	1 lb.	100	1
Dithane M-22	1 lb.	100	1
Orthocide 406	2 lb.	90[a]	—
Puratized 1122[b]	1.5 lb.	—	—
Puratized 1143[b]	1.5 lb.	—	—
Puratized 1180[b]	1.5 qt.	—	—
Vancide F1655W	1 lb.	100[c]	2
Fermate	1 lb.	100[c]	2
Mathieson 1563	0.5 lb.	74	—
Mathieson 1456	0.5 lb.	66	—

[a] Very severe rust developed within several weeks after spraying had been discontinued.
Severely phytotoxic.
[c] Severe rust developed after spraying had been discontinued.

TABLE 27
Relative performances of fungicides tested for control of rust of Merion bluegrass in Pennsylvania (49).

Fungicide[a]	Amt./1000 sq. ft.	No. applications[b]	Disease rating
none	—	—	1.8
Acti-dione	422 mg.[c]	1	1.4
	422 mg.[c]	2	0.7**
	844 mg.[c]	1	1.4
	844 mg.[c]	2	0.4**
Captan 50-W	2.5 lb.	1	1.7
	2.5 lb.	2	1.4*
	5.0 lb.	1	1.4
	5.0 lb.	2	1.0**
zineb plus $CuSO_4$ (3 Zn:1Cu)	2 oz.	1	1.2**
	2 oz.	2	1.2**
	4 oz.[c]	1	1.4
	4 oz.[c]	2	1.3*
zineb	2 oz.	1	1.6
	2 oz.	2	1.1**
	4 oz.	1	1.2**
	4 oz.	2	0.8**
Mathieson 1456	10 gm.	1	1.5
	10 gm.	2	1.5
	20 gm.	1	1.5
	20 gm.	2	1.3*

*Mathematically significant difference between this rating and that of check where P = 0.05.

**Mathematically significant difference between this rating and that of check where P = 0.01.

[a] One application 8/17/55, another 9/1/55.
[b] All applied in 2 gal. water/1000 sq. ft., 35 p.s.i.
[c] Phytotoxic.

TABLE 28
Fungicides tested for control of diseases of vegetables.

- Acti-dione
- B-622
- Bordeaux mixture
- captan
  - Captan 50-W
  - Orthocide 50-W
- Carbide & Carbon 7443
- Carbide & Carbon 7764
- Carbide & Carbon 8739
- COCS
- Copozin
- Cop-O-Zink
- Copper A Compound
- Copper dust
- Copper-manganese-zinc compound
- Coro SDD
- Crag Potato Fungicide 658
- Cyanamid 5223
- Dichlone
- ferbam
  - Fermate
- Filipin
- Fungicide "X"
- He 177
- maneb
  - Manzate
  - Dithane M-22
  - Dithane D-14 plus $ZnSO_4$
- Mathieson 1563
- Phygon XL
- Streptomycin D
- Sulfur dust
- Tennam
- Thioneb
- Vancide (liquid)
- Zerlate
- zineb
  - Dithane D-14 plus $ZnSO_4$
  - Parzate

TABLE 29
Yield of pole beans and ratings of fungicidal dusts used for control of rust in Florida (17).

Fungicide[a]	Percentage active ingredient	Rating of yield[b]	Rating of control[b] disease
Sulfur (dusting)[c]	—	2	2
Sulfur plus zineb	6.5% zineb	2	2
Sulfur plus maneb	7.0% maneb	1	1
Sulfur plus copper	5.0% copper	2	2
none	—	3	3

[a] Seven applications at 4- to 7-day intervals. Each application consisted of 40 lb./A.
[b] Lowest numbers indicate best performances.
[c] Currently recommended for grower use.

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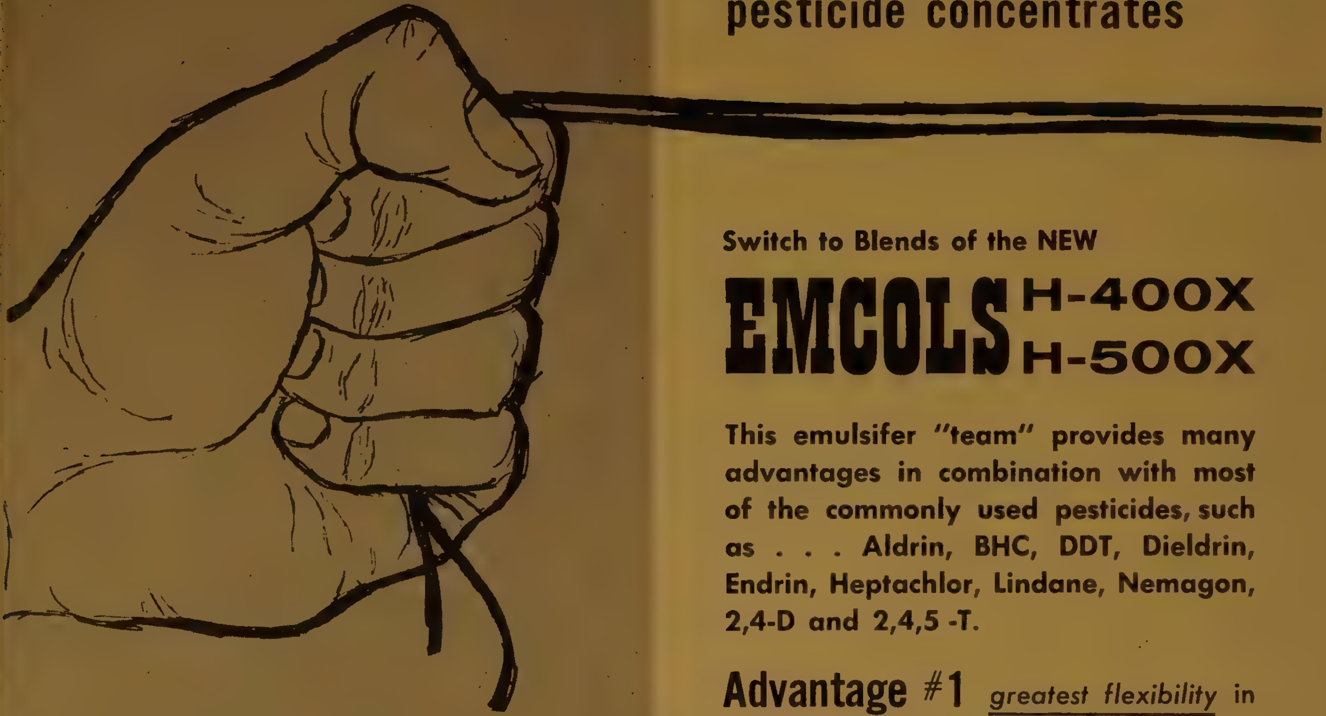

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ials, and several fungicides gave about the same degree of control that was obtained with ferbam (Table 22). In Maryland (31) blackspot was best controlled by zineb or ferbam sprays (Table 23), and by dusts containing sulfur and either ferbam or copper oxysulfate (Table 24).

Cercospora leafspot was most effectively controlled in Texas (56) with maneb dust or spray or with captan spray (Table 25).

Snapdragons. In 1 spray test in New York (40), zineb and maneb best controlled snapdragon rust. Materials were applied 10 times at weekly intervals. Plants in plots that had been sprayed with zineb or maneb remained rust-free for several weeks after spraying had been discontinued, whereas plants sprayed with ferbam or Vancide F1655W became badly rusted. Very severe rust developed in captan-sprayed plots within several weeks after spraying had been discontinued. Results of this test appeared in Table 26.

Bluegrass (var. Merion). Fungicides were applied once or twice to plots of Merion bluegrass in Pennsylvania (49) to control rust. Excellent control was obtained with 1 application of zineb or with 2 applications of Acti-dione or captan or zineb, with and without copper. Acti-dione and the zineb-copper formulation were phytotoxic at some concentrations. Results of this test are presented in Table 27.

Vegetables

Fungicides tested for control of diseases of vegetables are listed in Table 28.

Beans. Seven applications of dusting sulfur are recommended for pole bean rust control in Florida (17). Equally satisfactory control was obtained when copper dust (5%) or zineb dust (6.5%) was used with sulfur dust, while somewhat better control was obtained when maneb dust (7%) was used with sulfur.

Lima beans. Downy mildew was controlled in spray plots on Long Island (39) by 9 weekly applications of sprays consisting of 1 of the following fungicides: Tribasic copper sulfate, Manzate, Captan 50-W, C. & C. 7764, and Crag Potato Fungicide 658 (Table 30). Sprays were applied under 250 p.s.i. from 1 overhead and 2 drop nozzles/row at rates of 100 to 110 gal./A.

Celery. In Ohio, organic fungicides were more effective than Bordeaux mixture and Tribasic CuSO4 in controlling early blight of celery (Table 31). Plots receiving a tank mix formulation of ziram (SDD) and $ZnSO_4$ had least disease and highest yields of trimmed celery.

Sweet Corn. Helminthosporium leaf blight of sweet corn grown in muck soil in Florida was most effectively controlled by Manzate or Dithane Z-78 (Table 32). These and Parzate are fungicides that are recommended for grower use.

TABLE 30

Yield of lima beans and incidence of downy mildew in plots on Long Island (39).

Fungicide[a]	conc./100 gal.	Yield[b]	Percentage diseased pods
Tribasic copper sulfate	4 lb.	297.2	0.9
Manzate	2 lb.	320.3	1.3
Captan 50-W	3 lb.	325.4	1.3
C. and C. 7764	2 lb.	320.2	1.6
Crag Potato fungicide 658	2 lb.	322.8	1.8
Dithane D-14 plus $ZnSO_4$ plus Streptomycin D	2 qt.; 0.75 lb.; 100 ppm	327.9	3.2[c]
Dithane D-14 plus $ZnSO_4$	2 qt.; 0.75 lb.	310.0	3.5[c]
C. and C. 7443	2 lb.	320.2	3.6[c]
none	—	304.9	3.7[c]
Phygon XL	0.5 lb.	289.5	4.0[c]
Streptomycin D	100 ppm	304.9	4.3[c]
Tennam	2 qt.	315.1	4.4[c]

[a] Nine weekly applications of 100-110 gal./A. at 250 p.s.i.
[b] Thirty-lb. hampers/A.
[c] Differs significantly from best treatment, P = 0.01.

TABLE 31

Yield and incidence of early blight of celery in plots sprayed in Ohio (J. D. Wilson).

Treatments	Formulas	Yield Tons/Acre Trimmed	Number blighted leaves per 100′ row Aug. 15	Percent foliage dead Sept. 14
Bordeaux	4-2-100	9.84	3510	46
Bordeaux + X-100	4-2-.3-100	9.69	3615	36
Bordeaux + K704	4-2-.5-100	9.03	4340	42
Bordeaux + K704 + X-100	4-2-.5-.3-100	9.09	4765	45
Bordeaux + Tribasic	2-1-3-100	9.72	4590	41
Tribasic	4-100	9.27	4380	46
Tribasic + K704	4-.5-100	9.66	4045	44
Tennam	3-100	12.27	3928	31
Tennam + Tribasic	1.5-2-100	12.18	3027	34
Tennam + K704	3-.5-100	12.71	3610	39
Dithane M-22	2-100	15.39	2485	30
Dithane M-22 + K704	2-.5-100	15.42	2605	26
Dithane D-14 + $MnSO_4$	4-1-100	16.20	2520	30
B-Nabam + $MNSO_4$	4-1-100	15.56	2700	31
SDD + $ZnSO_4$	2-1-100	17.13	2300	27
SDD + $ZnSO_4$ + $MnSO_4$	2-.5-.5-100	15.51	2605	35
Zerlate	2-100	12.90	2755	40
Zerlate + Tribasic + Milk	1-2-.5-100	15.96	2675	25
Captan	3-100	13.92	2405	37
No treatment		6.81	6475	66

TABLE 32

Disease-control ratings and over-all perference ratings of fungicides tested for control of Helminthosporium turcium blight of sweet corn in Florida (20).

Fungicide[a]	conc./100 gal.	Leaf blight rating[b]	Experimenter's preference
Manzate[c]	1.5 lb.	0.94	1
Dithane Z-78[c]	2.0 lb.	0.94	2
Acti-dione	4 ppm	2.19	5
Parzate plus $ZnSO_4$[c]	2 qt.; 0.75 lb.	2.19	4
Captan 50-W	4 lb.	2.25	6
Zerlate plus Fermate	1 lb.; 1 lb.	1.75	3
None	—	2.75	7
L.S.D. where P = 0.05		0.32	
where P = 0.01		0.43	

[a] Applied 5 times at approximately 10-day intervals, beginning when plants were from 6 to 8 in. high.
[b] 0 is no disease; 5 is maximum severity possible.
[c] Recommended for grower use.

TABLE 33

Relative amounts of powdery mildew in cantaloupe plots sprayed 18 times at 3 to 5 day intervals (20).

Fungicide	conc./100 gal.	Disease rating[a]
Dithane Z-78	2 lb.	2.58
Dithane M-22[b]	2 lb.	1.75
Dithane Z-78; Karathane[b]	2 lb.; 1 lb.	1.17
Phygon XL	0.5 lb.	1.17
Tribasic $CuSO_4$	4 lb.	0.83
Copozin	6 lb.	0.92
Acti-dione; wettable sulfur[c]	8. ppm; 1 lb.	0.58
nabam plus $MnSO_4$	2 qt.; 1 lb.	1.83
nabam plus $CuSO_4$	2 qt.; 1 lb.	1.00
none	—	4.58
L.S.D. where P. = 0.05		0.72

[a] Where 0 is no disease and 5 is maximum amount of disease.
[b] Recommended for grower use. Because there is an excessive amount of copper in these soils, a copper-induced iron chlorosis occurs in most plants. Therefore, copper-containing fungicides are not recommended for grower use.
[c] Moderately phytotoxic.

FERTILIZER
Views and News

By Vincent Sauchelli

Farmer's Share of Consumer's Food Purchases

THE farmer is receiving an average of about 44 cents from every dollar the consumer spends for food, according to estimates of the U.S.D.A. This share varies for separate products from as much as 70 cents to 15 cents. But the grand average is the figure which is most frequently heard in political discussions of the farmer's plight. The fact that 44 cents is as large a share as the farmer received in any of the years from 1920 to 1939 and equal to the long term average from 1920 through 1953 is not mentioned by these same bemoaners.

No one, besides the farmer himself, - is perhaps as directly concerned with the cash farm income status, as the fertilizer industry. We want to see the farmer get his just due because we know that our prosperity is closely tied in with farm prosperity. A sound farm economy is what we pray and strive for. But we also must recognize some of the fundamental causes of the present farm income situation. Unappreciated perhaps by many urbanites are two revolutionary forces affecting the food and agricultural industries. One of these is the change in the buying habits of Mrs. America, the other is the revolution in farm technology.

A generation ago most mothers spent most of their waking hours in the kitchen preparing the next meal or cleaning up the last. Today the housewife spends on the average about 90 minutes a day preparing three meals. The chores of washing, peeling, shelling, plucking, blanching as performed by yesterday's housewife are for the most part done now by the food processor. The factory has moved into the kitchen. This "built in maid service" of processed foods costs money just as extra quality in other things costs money. It has been estimated that America's food bill this past year was about $64 billion or a little over 25% of the nation's disposable income. Prior to World War II our food costs represented annually about 23% of disposable income. These same food purchases if bought at today's prices would represent only about 17% of disposable income. The task of getting food from the farm to the dinner table costs American families some $24 billions per year - inclusive of cost of storing, processing, transporting, distributing and merchandising. This change in the food industry represents a gain for the housewife who seems satisfied with the extra values and is willing to pay for them. The farmer does not share directly in this more efficient preparation and marketing of his product, although many a city housewife feels that much of the relatively higher price of the food items she is pleased to buy is going into the farmer's pocket.

The revolution on the farm is as little appreciated by many people as that in the kitchen. Today's mechanized, streamlined American farm operating at high efficiency differs from grandfather's farm, as the 1956 kitchen is different from grandmother's. Technology on the farms of the nation has advanced in the last 15 years to where production has increased by 40% with 20% less farm workers. Output per man hour is about 66% higher now than in 1939. This efficiency is due to better seed, better soil management and fertilizer practices and to powered farm equipment.

Now this is the point I want to emphasize: Why should the average return to the farmer of what the consumer spends on food be brought into the discussion of the present status of farm income? Does the fertilizer industry measure its profits in terms of its share of our customers' gross receipts? Does any producer of goods gauge his profit in this way? We say with emphasis that what is and should be considered is not how much of the nation's food expenditures finally goes into the farmer's pocket but rather how do his production costs compare with his selling prices? That is the central question and it must be kept always before us in our consideration of the status of the farmer's income.

The spectacular increase in efficiency in industry and agriculture achieved during the past decade is causing many a doubting Thomas to question its value. These persons contend that increased efficiency causes depressed prices. But economists have shown that a vast difference exists between a decline in prices due to a general deflation, and a decline due to an increase in efficiency: the former would cause a decline in the income of all farmers, whereas the latter causes a decline only in the product in which the increase in efficiency occurred. The efficient farmer is still making a profit.

We are witnessing the effect of a price squeeze and an efficiency squeeze throughout all industries. This is, of course, nothing new, but it seems to be working more intensely today than formerly. The income of any one farmer depends upon his volume of production, the prices in the

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market and his costs. He cannot influence the market price of what he gets for his products nor that of what he buys. But he can do a lot about lowering his own unit production cost by expanding his yields per acre and increasing his efficiency. Commercial fertilizer wisely used is one of the most effective ways by which lower unit costs of production can be achieved.

The advance in agricultural science means that farmers generally will have to become more efficient and progressive in order to survive. The technological revolution in industry and on the farm is widening the gap between the progressive profit-making farmer and the mere subsistence farmer. This is indeed true of all segments of the general agricultural economy, including the fertilizer and pesticide industries. Those that appreciate the nature and extent of this revolution and move in step with it will grow and prosper; those that fail will be left behind to wither and disappear.

Moisture Requirements In Formulations of Granulated Fertilizers

LABORATORY studies conducted by Fertilizer and Lime Division of the U.S.D.A. at Beltsville, Maryland, may serve as a guide to the Production Superintendent in determining how much moisture is required to get a satisfactory agglomeration of mixed fertilizers under the conditions of his plant operation. They point out that these studies were prompted by the intense interest of the fertilizer industry in the economical production of granulated fertilizers. About 2,000,000 tons of granulated fertilizers are being produced annually at present in the U.S. according to recent estimates.

The study brings out that the volume of liquid phase on the surface of the solid materials in the mixture is one of the most important factors influencing the formation of the agglomerates or granules. The types and amounts of salts dissolved in the liquid present at the surface of the fertilizer particles influence the volume of the liquid phase. Of the salts commonly used in the formulation, ammonium nitrate was the most effective in lowering the amount of moisture needed for producing the best kind of agglomeration. Next in effectiveness were ammonium sulfate and potassium chloride, respectively. The investigators observe that there seems to be a direct relationship between the solubility of the salt and the rate at which moisture requirement decreases as the soluble salt content of the mixed fertilizer increases. For example, when ammonium nitrate replaced ammonium sulfate up to an equivalence of 7 units of nitrogen in ammoniated mixed fertilizers, containing ordinary or triple superphosphate and muriate of potash, the moisture requirement for the most effective granulation of the mixture was reduced from about 14% to 2% in the case of a 1-1-1 ratio and from 16% to 6% for a 1-2-1 ratio fertilizer.

Quality Control in the Fertilizer Plant

THIS item could very well have been titled "What price inefficiency" because it has to do with the avoidable waste in the general formulation of mixed fertilizers. It seems customary for the generality of fertilizer producers to leave a significant margin of overages in the mixtures to meet the guarantee. At least that is the impression one gets by a careful study of many of the annual reports issued by State Regulatory agencies. That such overages, in the aggregate, can cost the fertilizer industry several millions of dollars annually is not too well known or understood.

In a study of the composition of mixed fertilizers in relation to guarantee made by Messrs. W. Scholl and H. M. Wallace of the U.S.D.A. for the year 1948, it was shown that the net amount of overruns for all N-P-K mixtures sold in the U.S.A. that year were: nitrogen 7,837 tons; P_2O_5, 33,384 tons; and K_2O, 28,471 tons or an average of 3 percent in excess of the guaranteed total nutrients.

These huge annual giveaways of plant nutrients for which the industry gets no credit could be avoided for the most part by improved control techniques based on statistical quality control practices. Management in many other industries has been applying these new techniques successfully for many years; the fertilizer industry should become better acquainted with them and study how to adapt them to each important step of fertilizer manufacture and laboratory control procedures.

Let me illustrate by citing the overages reported for the year 1953 by the Missouri State Chemist: Missouri is one of the few states which publishes an annual summary of the variations from manufacturers' guarantee of analysis of mixed fertilizers sold in the state. We shall consider the overrun in potash (K_2O).

In the calendar year 1953 the industry sold 8,944 tons of K_2O in the form of materials and 55,483 tons in mixed goods, making a total of 64,427 tons K_2O. The average of potash overruns for all goods was 5.5%. Applying this percent overage to the total tonnage sold gives a grand total of 3,543 tons of K_2O. Estimating the value of K_2O at 4 cents a pound or $80. per ton, and multiplying this by the total tonnage gives a value of $273,440. Thus roughly, the fertilizer industry gave Missouri farmers an excess value in potash alone of at least a quarter million dollars for which they got no credit whatsoever. Some companies gave overages of nitrogen and potash; some gave substantial overages of all major nutrients; and some of course, were deficient in these same nutrients. In the case of deficiencies the guilty manufacturer is properly penalized.

The point of this item is that some factors in the fertilizer industry are becoming aware of the possibilities of increasing efficiency in manufacturing procedures by means of statistical quality control methods and thereby keeping overruns to a minimum compatible with guarantees. We know of one company that has been applying quality control to its fertilizer manufacturing procedures since 1950 with profitable results. More fertilizer personnel should adopt this modern managerial tool.★★

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Technical SECTION

Insecticide-Fertilizer Mixture Recommendations in Alabama

ALTHOUGH less than one per cent of the mixed fertilizer tonnage used in the U. S. is represented by insecticide-fertilizer mixtures, demand is growing and tonnage of such mixtures increased 71 percent in 1954. The South Atlantic states of Florida, Georgia, North and South Carolina and Virginia lead in the use of the insecticide-fertilizer mixtures.

At least two-thirds of the 149,100 tons of mixtures used in 1954 in the U. S. was for corn rootworm and wireworm control. Aldrin was used more than other insecticides in the mixtures; second was chlordane and DDT was next most frequently used. Alabama reports that the use of heptachlor in these applications is gaining.

In the past the form of insecticide has been powder; however, there has been a rapid increase in the use of granules with a particle size of 30 to 60 mesh. The pesticide forms also include some emulsions and solutions in low-viscosity solvents. The solutions in volatile solvents may gain in use, it is believed. Granular fertilizers, like granular insecticides, are expanding in production and use.

The proportions of insecticide to fertilizer depend on a number of factors. First, the rate per acre at which the fertilizer will be applied must be determined. Then the amount of insecticide to be added depends, of course, on the type of insect to be controlled, etc. The quantity of insecticide per ton of fertilizer will vary from 1 to 30 pounds of aldrin, ¼ to 66 pounds of chlordane, and 1½ to 40 pounds of DDT on a national scale. However, in Alabama the following procedure is followed:

1) Imported fire ant in pastures: the insecticides recommended are 4 pounds of chlordane or 2 pounds of dieldrin or heptachlor per acre. Fertilizers recommended are 500 pounds per acre of 0-14-14, 0-16-8, or superphosphate. Therefore, the mixture should include 16 pounds of chlordane or 8 pounds of dieldrin or heptachlor. Eighty pounds of 20 per cent chlordane, 80 pounds of 10 per cent dieldrin, or 40 pounds of 20 per cent heptachlor granules in a ton of fertilizer would be the proper mixture.

2) Rootworms and wireworms in corn: the insecticides recommended are 1 pound of aldrin, dieldrin, or heptachlor per acre in the fertilizer. Fertilizers recommended are 250 pounds per acre of 4-10-7, 8-8-8, or 4-12-12. Insecticide-fertilizer mixtures for corn should contain 8 pounds per ton of aldrin, dieldrin, or heptachlor.

3) Wireworms on sweetpotatoes: the recommendations for controlling wireworms on sweetpotatoes are 2 pounds of aldrin, dieldrin, or heptachlor per acre. Sweetpotatoes may be fertilized with 80 pounds per acre of a 4-10-7 fertilizer. Insecticide-fertilizer mixtures for sweetpotatoes should contain 5 pounds per ton of aldrin, dieldrin, or heptachlor.

Mixing of pesticides and fertilizer is done just before the cured fertilizer is bagged. Mixing before curing is complete may result in the break-down of the insecticides. The same equipment used for mixing the fertilizer can be used, but the mixing time is prolonged. Even when mixing is prolonged, a uniform blend may be difficult to get if the particle sizes and densities of the fertilizer and the pesticide vary too much. Granular formulations of insecticides have helped to solve some of these problems.

Insecticide-Fertilizer Mixtures, W. G. Eden; presented at Alabama Pest Control Conference, Auburn Ala., Feb. 22-24, 1956.

•

Antibiotics for Plant Disease

Five new antibiotics now under test by the U. S. Department of Agriculture and cooperating state experiment stations, show great promise of controlling a variety of plant diseases.

In greenhouse experiments, Anisomycin, Mycostatin, Oligomycin, Griseofulvin and Filipin were effective against one or more of four fungus diseases affecting lima and snap beans. One, Oligomycin, prevented infection of snap and dry beans with rust and anthracnose, and lima beans with downy mildew.

Previous to tests with the five new antibiotics, other antibiotics had proved effective against a score of bacterial diseases. Only a few fungus diseases had been controlled, such as tobacco blue mold, downy mildew of lima beans, tomato late blight and cherry leaf spot.

The U. S. Department of Agriculture reports that plant pathologists used a dilute antibiotic spray, and then inoculated the plants with spores of one of the test disease organisms.

•

Quack Grass Control in Corn

A new idea on how to get rid of quack grass in corn fields is offered by Wisconsin agricultural experiment station researchers. *Fertilize the quackgrass*, they say in the station's latest annual report. Best results in recent Wisconsin tests with weed killers, it is explained, came when the quackgrass was 4 to 8 inches tall. Nitrogen fertilizer, applied early in the spring, stimulates this growth. When there is a dense growth of new shoots, the weed killer can then be applied before spring plowing for corn, the report advises. Dalapon, maleic hydrazide (MH) and amino triazole were tried in the tests. MH and amino triazole at 4 to 8 lbs. per acre were harmless to corn, but in some tests dalapon at the same rates caused

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injury. This, according to the report, may have been due to wet, cool soil and light stands of quackgrass shoots. All three chemicals controlled quackgrass satisfactorily and increased corn yield by 30-35 bushels per acre over untreated, uncultivated plots and 15-20 bushels over treated plots. Dalapon and amino triazole need further testing, it was decided, to learn the best time and rate of application. Continuing, the report says "It looks as if early spring is the best time for both dalapon and MH; applications during summer and fall have been less successful."

•

Lead Arsenate for Curculios

Lead arsenate is still a good insecticide for spraying plum curculios in cherry trees, a Wisconsin experiment station report states. By adding a material called CI-510, researchers at the Madison station say the old standby insecticide "seems to be just as good as the newer insecticides. "CI-510 is described as a whipping ingredient used by confectioners, which has been under test as a spray additive for several years. While it seems to work well with lead arsenate, it does not improve metacide and is definitely not recommended by the Wisconsin authorities for methoxychlor sprays.

•

Chemicals for Oat Seed

Ceresan M was the most effective seed protectant treatment for oats in tests over the past two years at substations of the Alabama Agricultural Experiment Station. Other chemicals tested as seed protectants were Agrox, Orthocide 75, Panogen, and Vancide 51. Ceresan M was very effective for control of Victoria blight, most serious seedling disease of oats in Alabama. Oats were seeded at the rate of two bushels per acre in the tests.

Seed Treatment Protects Seedling Oats Against Disease and Results in Better Stands. J. A. Lyle, Agricultural Experiment Station System, Alabama Polytechnic Institute, Vol. 2, No. 2.

Nitric Acid: More Interesting

Agricultural applications of nitric acid are being actively investigated as a result of 1) improvement in the process for making synthetic ammonia which has radically changed the economics of making nitric acid, and 2) products of nitric acid are valuable fertilizer ingredients.

The substitution of nitric acid for sulfuric in fertilizer production has been studied with much interest ever since the prospective sulfur shortage in 1950-51. However, expensive equipment and a number of processing steps are required in the basic method of treating phosphate rock with nitric acid. All the processes need to use ammonia and, in most cases, resultant slurries or solutions require evaporation. The products must be dried thoroughly and stored in moisture-proof containers to prevent caking. Further work is expected to eliminate some of the bothersome features and further improve the economics of making concentrated fertilizers without the use of sulfur or sulfuric acid.

Industrial & Engineering Chemistry, March, 1956, Part 1.

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Wireworm Control in Tobacco

A broadcast treatment of insecticide over the field before transplanting from the seed bed is now recommended by North Carolina State College for controlling wireworms which attack the roots of tobacco field plants. In a paper describing new approaches to tobacco wireworm control, Drs. R. L. Rabb and F. E. Guthrie point out that recommended control in the past has been the use of insecticide in transplant water.

Where plants are taken to the field from the seed bed and set with a hand transplanter and about 200 gallons of water per acre are used, excellent results are obtained. However, control has not been consistently adequate where mechanical setters have been used, Rabb and Guthrie explain.

Until water placement mechanisms are perfected, North Carolina State believes that treated setting water should be recommended only when hand setters are utilized. Excellent wireworm controls have been obtained by broadcasting the insecticide over the field before planting. A treatment of aldrin spray which results in only 4 pounds of actual aldrin applied per acre is an effective control.

Broadcast treatment affords the additional advantage of controlling a variety of soil insects in the field. Cutworms, white grubs and other insect larvae are killed by the single application.

•

European Chafer Still Active

The European chafer, a pest attacking turf, pastures and lawns in New York State, still resists chemical treatment in Connecticut. The pest was found in Meriden in 1951, and the infestation was attacked with insecticides in 1951 and 1952. Some control was evident, in this highly localized infested area, but the pest remained. Tht flight of adults continued from soil treated again in 1955.

The Connecticut Agricultural Experiment Station says that research on related grubs indicates effective control of the European chafer in lawns with chlordane or dieldrin, DDT or methoxychlor. For pastures or meadows, dieldrin should be effective.

More detailed information on control is given in a special circular, European Chafer Quarantine, The Connecticut Agricultural Experiment Station, Box 1106, New Haven 4. Federal and State quarantines restrict movement of soil or plants bearing soil from the infested area without inspection or supervised treatment.

•

Control for Weed Trees

Ammate, applied in chopped cups spaced six inches apart at the base of a tree at the rate of one heaping tablespoonful of crystals, will effectively kill hickories after two successive applications of the usual dose of ammate in overlapping deep ax cuts.

2,4-D and 2,4,5-T or a mixture of both of these silvicides is also used. They are usually bought in concentrated form and diluted one pint to

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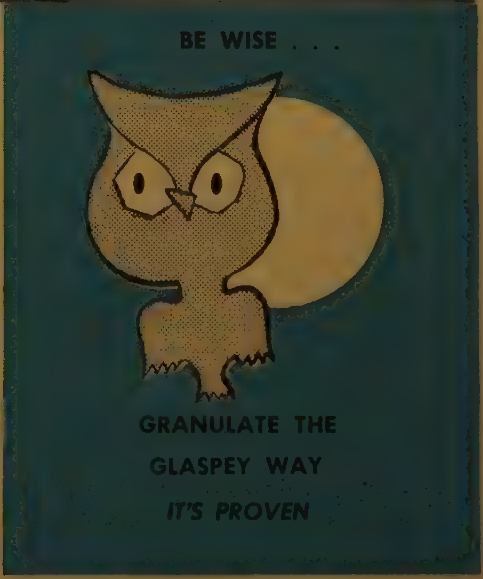
Installation pictured above, Farm Chemical Co., Longmont, Colo.



6 gallons of water or oil. Deep ax cuts encircling the tree are made in the tree trunk and the chemical is poured into these hacks. Sprouting of stumps can be reduced to about 10 per cent if the oil solution of these chemicals is used to thoroughly wet the stump.

Organic silvicides can be used at 10 to 20 per cent for basal spray to kill trees; also, at low concentrations of one-half per cent in water to spray the foliage of small weed trees. This use is too expensive, however, for genera forest improvement work.

Control of Weed Trees in Forests, George I. Garin; presented at the Alabama Pest Control Conference, Auburn Ala., Feb. 22-24 1956.

•

Equipment for Liquid Fertilizer

With the recent introduction of complete solutions containing N,P, and K, problems with liquid nitrogen application equipment have become more complex. Aluminum is satisfactory for use with liquid nitrogen; however, it is attacked by the phosphoric acid in the complete solutions. Thus, stainless steel is the only metal that is completely successful for handling all solutions.

Non-pressure nitrogen solutions, such as solutions 32 and 28 containing urea, ammonium nitrate, and water, are still being extensively used. Solution 28, with the same ingredients as Solution 32 but in a different proportion, has also been made available. The primary advantage of this solution is a lower crystallization temperature (O° F.) than the 32° F. for Solution 32. Both solutions can be stored in steel tanks with fair success, although eventually rust and corrosion will cause trouble. Applicators usually have a cast-iron or nylon roller pump, aluminum tank, strainer, and broom with stainless steel nozzles. Solutions still need to be non-corrosive to steel, brass, bronze, or copper before the ordinary weed sprayer can be used.

Low-pressure nitrogen solutions contain anhydrous ammonia, ammonium nitrate, and water. The presence of anhydrous ammonia lessens the cost of the material, but creates many problems. Pressure-type storage in welded tanks is necessary and there have been cases where a riveted steel tank that stored Solution 32 successfully soon developed a leak when used for low-pressure solutions. Compressed air is probably the most successful way to move these solutions. It eliminates corrosion damage to pumps, speeds up transferring, and prevents vapor locking. Main disadvantage is the cost of equipment rugged enough for continuous operation.

Complete fertilizer solutions containing nitrogen, phosphorus, and potassium are now available in some areas. They have no vapor pressure and need not be stored under pressure. Steel is suitable for storing this material, although stainless steel reactor tanks should be used for blending.

Equipment Problems With Liquid Fertilizer Solutions, Summary of Presentations, Eighth Illinois Custom Spray Operators' Training School, Urbana, Ill., Jan. 26-27, 1956.

Prescreening in Granulation

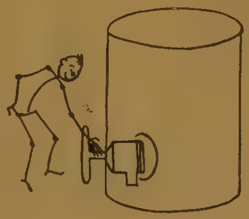
The fineness value equal to the desired top size of the finished granules is the criterion for proper prescreening of raw materials for granulation. The classifier screen can be either two single surface vibrating screens or preferably a two surface screen, which insures top size value on top deck and removes the fines through second deck to give an intermediate product. Over-all dimensions of these classifier screens should depend on tonnage and process involved; the circulating load factors of crushed oversize and recycled fines are also important.

The two surface screen includes air suction application through four inch diameter suction pipes, and a special fines hopper with adjustable proportioning gate which allows operators to alter the point of separation on second surface instantaneously, permitting a change of both recycle and fines percentage.

For six mesh and coarser separations, galvanized steel Tyrod is con-

. . . . From the Superintendent's Notebook

PRACTICAL suggestions for production personnel, gleaned from actual experience. It is hoped to have contributions to this column from readers. Production men are invited to send in practical items of this kind which may help other men engaged in production work. Send to Ag Chem., Caldwell, N. J.



How do you empty the tank?

Some acid tanks have plug valves operated from the tank top to cut off acid flow in case of a leak between the line valve and the tank. These plug valves usually consist of a tapered plug seat, mounted between flanges in the bottom outlet of the tank, and a mating plug on the end of a steel rod. Screw threads on the upper end of the rod, engaging a nut welded to a bracket permit raising and lowering the heavy rod. If the rod breaks or corrodes through and drops the plug in the seat, how do you empty the tank? One successful method used was to fill the discharge line with air under plant air pressure, and then quickly open the line valve at the tank. The sudden inrush of air lifted the plug off its seat and while several attempts had to be made before it fell clear of the seat, we were successful and could empty the tank for repair.

Submitted by W. Davis, plant superintendent, Davison Chemical Co.

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Potatoes (Scab and Damping-Off)
Lettuce (Leaf Drop and Bottom Rot)
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sidered a standard application; for finer than six mesh, stainless steel Ty-rod is generally accepted.

Granular Fertilizer Round Table, a paper presented by Wayne W. King, W. S. Tyler Co. at Washington, D. C. meeting, October, 1955.

•

Check Chlorosis in Blueberries

Use of chelated iron compounds appears to be the most practical solution to the chlorosis problem of Ohio blueberry growers. First used on citrus fruits in 1951 to correct iron chlorosis, iron chelates now have been formulated that correct similar disorders in other crops. Results of tests made by Ohio State University in 1952, 1953 and 1954 show that a rate of application of 1.5 ounces iron chelate to newly established plants and as much as 4 ounces to large plants will control chlorosis.

The Ohio Station also tested chelated iron compounds for foliar application, with successful control obtained using two applications of a spray containing two pounds per 100 gallons of water. Iron Chelates Helping Correct Chlorosis in Blueberries, by Robert G. Hill, Jr., *Ohio Farm and Home Research*, March-April, 1956

•

Soil Effect on Nutrients

G. R. Epperson of the Virginia Agricultural Extension Service reports that toxic quantities of manganese may be available to plants under very acid soil conditions; and manganese deficiency may occur on sandy soils having a high pH. As a general rule, minor elements such as boron, copper, iron, manganese and zinc are highly soluble, and in acid soils are readily available to plants.

The available supply of calcium and magnesium in very acid soils is often too small for satisfactory plant growth. As soil goes from acid to alkaline, calcium availability increases at a fast rate; magnesium availability increases, but at a reduced rate compared to that of calcium.

Soil reaction seems to have very little, if any effect, on potassium availability. Soil Acidity Often Limits Nutrient Availability, G. R. Epperson, *Chilean Nitrate Farm Forum*, December, 1955.

Book Reviews

Farm Soils

by Edmund L. Worthen and Samuel R. Aldrich, Published by John Wiley & Sons, Inc., New York — 5th edition. VII—439 pages, $4.96.

This is a welcome addition to the growing literature on soils and crops. Teachers, students, farmers, fertilizer salesmen and farm-supply staffs will find the information on principles of soil management and fertilizers authoritative and easy to understand. The interrelationship of soils and crops is effectively explained. The authors decided to address the book to the second person and to use words and concepts common to writers of extension bulletins and farm magazines. They have succeeded well in their purpose. It is a refreshing change from the formality of the usual text book.

This reviewer found it interesting to compare this 5th edition with the 2nd edition which was prepared by Mr. Worthen alone. The difference is very marked and reflects the many advances made in soil science and farm management practices during the past 25 years—a period in which American agriculture evolved into a mechanized, highly efficient industry.

Reviewed by V. Sauchelli, Davison Chemical Co., Baltimore, Md.

•

Insect Pests of Farm, Garden and Orchard, by L. M. Peairs and R. H. Davidson. Fifth Edition, published by John Wiley & Sons, Inc., New York. 662 pages, 6 x 9¼ inches, cloth binding, price $8.50.

This fifth edition features information on over 60 new pest species, including data on their destructive effects and distribution. It outlines the place of insects in the animal kingdom; how insects are classified; the principal orders and families of insects; and the principles and practices involving insect control. A new chapter includes information on insecticide formulations, application equipment, dilution tables, compatability and other pertinent data. According to the authors, the book is designed primarily to serve as a textbook for beginning college courses in applied or economic entomology.

•

The Gardener's Bug Book by Cynthia Westcott. Published by Doubleday & Co., Inc., New York. 580 pages, cloth binding 6 x 9 inches, price $7.50.

This text is directed to the layman, home gardener, beginning entomologist. Information on some 1100 insects, mites and other animal pests that commonly attack trees, shrubs, vines, lawns, flowers, fruits, and vegetables in home gardens is discussed in non-technical language.

Control measures are suggested for common garden pests. Chapter 1 briefly summarizes the importance of pests to modern gardeners; chapter 2 includes a dictionary of pesticides; chapter 3 tells how to apply these; chapter 4 tells how insects are formed and classified; chapter 5 gives descriptions, life histories and control measures for individual pests; and chapter 6 provides a check list of more important pests occurring on about 500 host plants.

•

Approved Practices In Pasture Management. By M. H. McVickar, Ph. D., Chief Agronomist for California Spray-Chemical Corporation, and formerly in charge of Agronomic Education for the National Plant Food Institute. Published by The Interstate Science Publishers, Danville, Illinois, 1956. 256 pages. Illustrated. Price: $2.40.

This text covers the important activities associated with establishment, management, and efficient use of pastures as grazing lands or as a source of fine winter feed for livestock. Information in the book is as specific as possible for all U. S. pasture areas.

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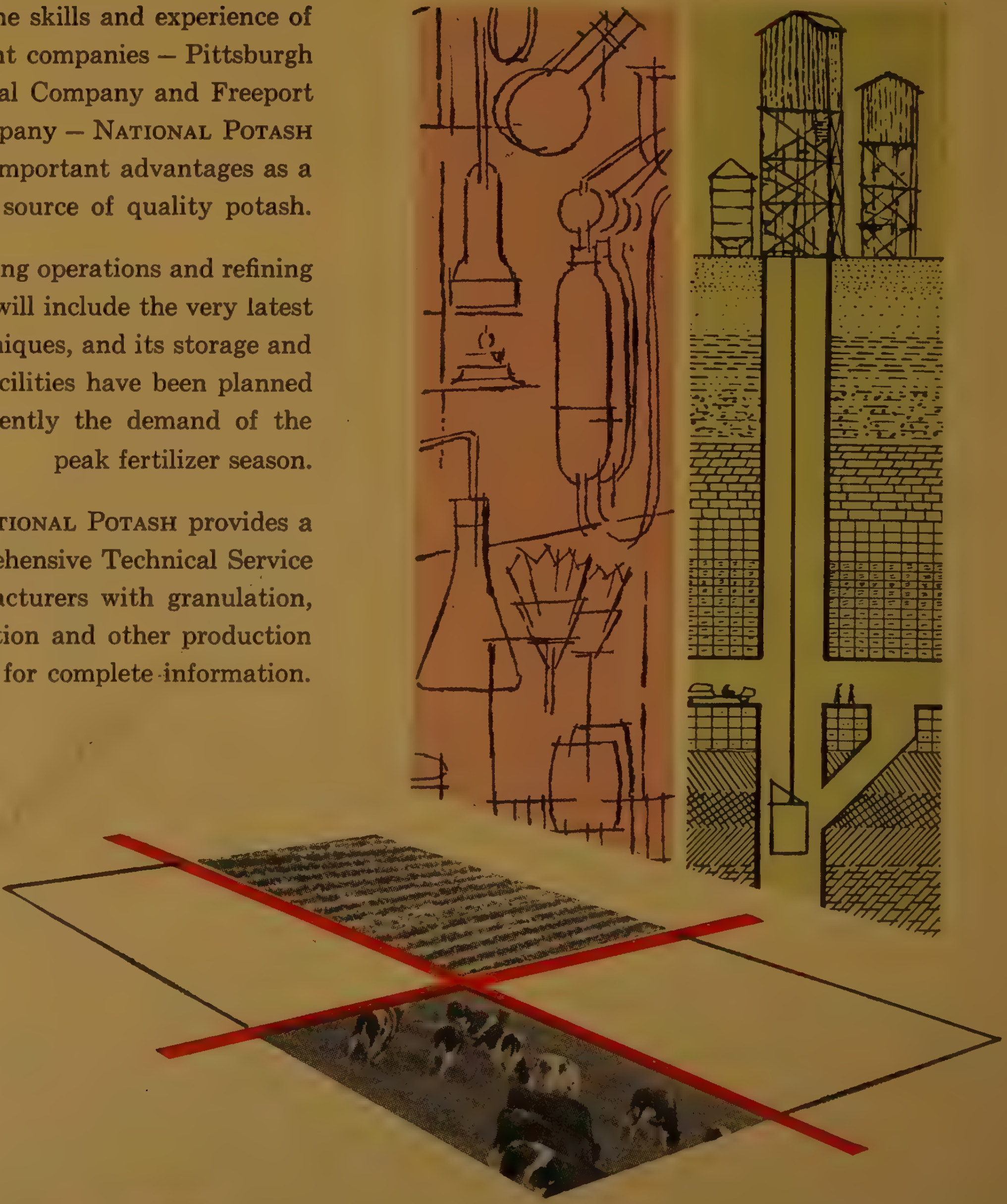

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WASHINGTON
Report

by
Donald G. Lerch
Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

MORE pesticide formulating plants are in prospect for Central America. That's the feeling among several key people I met during my recent series of conferences in Central America. When you stand down there and look north toward the United States, it makes good sense for the highly developed chemical industry of the U. S. to ship technical grades of pesticide chemicals to formulating plants in Central America. The transfer of a high value, low volume and weight product makes economic sense.

While in San Jose I had the opportunity of visiting Quimagra—the pesticide plant directed by Channing Fredrickson as the chief executive. His plant, employing 16 workers in two shifts plus supervisory help and with the main season running from May to December, would give most any factory of like size in the United States quite a race when it comes to adding up the value and capability of the equipment. Whether it's nickel, or special grades of stainless steel, or dust mixing equipment with fine calibration, you'll find it at Quimagra. You will also hear the ring of hammers and concrete mixers as a new addition takes shape—the new plant is already expanding.

Cotton is the principal crop for which the plant formulates, but there are also other crops which someday will soak up thousands of pounds of pesticides, far outstripping the current output of Central American plants.

Also talked to Julius Miller, one of the Sears & Roebuck executives in San Jose who was highly optimistic about the prospects for well managed and operated American business in the area.

My particular mission in Central America was to help launch the first agricultural information workshop ever held in the area. It took place at the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica. Over 20 representatives from ministries of agriculture, farm newspapers, magazines, and radio stations of Costa Rica, Ecuador, Peru, Nicaragua ,and the United States attended for the purpose of speeding the development of agricultural information as an aid to improving agricultural practices and, incidentally, increasing the awareness of opportunities for the profitable use of pesticides and other chemicals and farm equipment.

Speaking for the National Agricultural Chemicals Association, Frank Cappy, sales manager, Agricultural Chemicals Division, American Cyanamid Company, New York, told participants of the keen interest of agricultural chemical manufacturers in the further development of effective means of mass communications with farmers in Central and South America. On behalf of the Association he extended an offer to help and cooperation in the exchange of related information and educational materials.

He followed with a statement on the operation of his own company, emphasizing the origin of agricultural chemicals in the research laboratory and following their development step by step until the product is ready for marketing, advertising, sales promotion, and publicity. Cappy opened this part of his remarks by saying, "We want to advertise." He furthermore indicated interest in data which various countries later agreed to assemble on the circulation and rates on mass media reaching farmers in Central and South American countries.

This general survey of mass media was further outlined by the writer who offered to serve as a collecting point for this information, having it tabulated and reproduced. This information would then be made available to all members of industry, both in the United States and Latin America.

Ernesto Groskroth, entomologist, Hercules Powder Company, emphasized the need for close working relationships between the research and field staffs of chemical companies. He furthermore reviewed some of the projects his firm undertakes in Central and South America, and reviewed his company's interest in advertising and market development.

Another representative of the American Cyanamid Company, W. M. Fitzsimmons, in charge of affairs for the company in Mexico, reviewed Cyanamid's interest in market development. He also emphasized the need for presenting factual information to farmers through media in which they have confidence.

Meetings are now underway in Costa Rica among members of the Costa Rican Ministry of Agriculture aiming at the selection of several subjects which might lend themselves to agricultural campaigns attracting the support of agricultural information media. As soon as the subjects are selected, and it is probable that one or more will involve the use of pesticides, businessmen in Costa Rica and pesticide manufacturers in general will be invited to a second meeting to determine the extent of their interest and participation in such campaign. It is then hoped that the results of the campaigns, which may extend over

(*Continued on Page* 123)

LISTENING Post

Soil Treatments For Potato Scab Control in Pennsylvania

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

HARRY C. Fink of Pennsylvania State University, notes that newer marketing practices, including washing and packaging in transparent bags, emphasize appearance and make control of potash scab (*Streptomyces scabies*) important. Scab is one of the most prevalent disfiguring diseases of potato in Pennsylvania. Reports that PCNB (pentachloronitrobenzene) has controlled the disease led to an evaluation of that material under Pennsylvania conditions. In addition, a new soil fungicide, Vapam (sodium-N-methyl dithiocarbamate, dehydrate), was tested.

A field of loam soil was infested with the scab organism. One week after the inoculum was placed in the soil the chemicals were added as water solutions. Vapam (31%) was applied at rates of 25, 50 and 100 lbs. per acre and PCNB (75%) at 25, 50, 75 and 100 lbs. per acre, to the tri-replicated plots. The solutions were sprayed with a hand boom on the surface of the soil, which was immediately disked to assure complete incorporation of the chemicals in the soil. The plots were then sprayed with a boom type orchard sprayer to form a water seal at the surface. Two weeks later Katahadin potatoes were machine planted 1 foot apart in 36-inch rows. The plants received 6 sprays of zineb and DDT for control of insects and foliar diseases during the season.

Yield and scab infection readings were taken from 40 row-feet located centrally in the plots. Severity of scab was recorded on the basis of percentage of area of tuber surface affected by deep scab. Five categories were used. 1 = 1—10; 2 = 11—20; 3 = 21—40; 4 = 41—60, and 5 = 61—100 percent of the surface scabbed. These data were analyzed and are presented in Table 2.

Plants in treated soil produced higher yields than those growing in untreated soil but the difference was not significant. The low yield of tubers in plots receiving 25 lbs. PCNB per acre is unexplained. If phytotoxicity were the cause, yields should be lower at higher rates of application. This trend is apparent in the yield of plots treated with varying amounts of Vapam. It should be stressed that this difference was found not significant when the data were subjected to the F test.

Both PCNB and Vapam gave a highly significant degree of scab control. Control with PCNB tended to decrease at higher rates but these differences were not significant. The reverse effect was apparent with Vapam; with each increase in rate there was corresponding increase in scab control. In addition, the control by Vapam at 50 and 100 pounds per acre was significantly better than that by PCNB at these rates.

These data indicate that PCNB and Vapam resulted in control of potato scab under conditions existing during the course of this experiment. More testing is necessary but since there is widespread interest in potato scab control these preliminary results are presented.

Susceptibility of Some Vegetables to Streptomycin Injury

ROBERT B. Marlatt of the Arizona Agricultural Experiment Station writes that because streptomycin is one of the promising antibiotics for controlling vegetable diseases, it is important to know something of the relative tolerances of vegetables to streptomycin sulfate, which is a commonly used form of streptomycin.

Fourteen types of vegetables grown in the greenhouse in Arizona were sprayed with three aqueous solutions of streptomycin sulfate (Merck & Co.) at concentrations of 1:1000, 1:100, and 1:25. Du Pont Spreader-Sticker was added to the solutions before spraying. Pot-grown plants were sprayed after they had acquired several true leaves. All were vigorously growing, young plants. Three plants of each kind were sprayed once with each concentration. For each vegetable there were control plants which received no streptomycin. The material was applied with a small household type hand-sprayer until it began to drip from all of the leaves.

During the experiment, greenhouse air temperatures varied from 55° to 95° F. No records were made of humidity but the air was quite dry as compared to greenhouse conditions in more humid regions. Because of the low humidity it is possible that the antibiotic was not absorbed as completely as it would

TABLE 2.

Foliar symptoms of streptomycin sulfate spray injury on vegetables.

Vegetable	Variety	Symptoms After Spraying With Various Concentrations[a] 1:1000	1:100	1:25	Control
Bean	Pinto	0	Slight Chlorosis	Slight Chlorosis	0
Cabbage	Golden Acre	0	Slight Chlorosis	Moderate Chlorosis	0
Cantaloup	PMR 45	0	Slight Chlorosis	Moderate Chlorosis	0
Celery	Utah	0	Slight Chlorosis	Severe Chlorosis and Stunting	0
Eggplant	Black Beauty	0	Slight Chlorosis	Moderate Chlorosis	0
Lettuce	Great Lakes	0	0	Slight Chlorosis and Stunting	0
Pea	Pacific Freezer	0	0	0	
Pepper	Anaheim	0	0	0	0
Potato	Red Pontiac	Slight Chlorosis	Moderate Chlorosis	Moderate Chlorosis	0
Radish	Early Scarlet Globe	Slight Chlorosis	Moderate Chlorosis	Severe Chlorosis and Stunting	0
Spinach	Prickly Winter	0	0	Slight Chlorosis	0
Sweet Potato	Porto Rico	0	0	Slight Chlorosis	0
Tomato	Improved Pearson	0	0	Moderate Chlorosis	0
Watermelon	Peacock	0	0	0	0

[a] Slight Chlorosis—Scattered chlorotic spots where droplets had remained on the leaves.
Moderate Chlorosis—Chlorotic spots frequently coalesced leaf margins often chlorotic.
Severe Chlorosis—Some leaves entirely yellow or white.

have been had the spray droplets not dried so readily.

The results, which are shown in Table 1, indicate, that celery and radish were especially susceptible to streptomycin injury. Peas, peppers, and watermelons were apparently very tolerant.

In most instances plants exhibited the severest symptoms in 6 to 8

(Continued on Page 131)

TABLE 1.

Yield and severity of scab on Katahadin potatoes grown in artificially infested soil treated with pentachloronitrobenzene and Vapam.

Pounds chemical Per Acre	Yield Bu. Per Acre	Severity[a] of Scab Average
PCNB		
25	196	24 **
50	307	33.6**
75	350	32.6**
100	325	36.0**
Vapam		
25	312	19.6**
50	274	16.3**
100	262	10.3**
	CK	
0	259	48.3

[a] L.S.D. .01 11.90
**Significant at .01 level over check

Weevil Survival Counts High; Spotted Alfalfa Aphid Threat

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Economic Insect Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward

EXAMINATION of surface woods trash to determine the number of boll weevils that survived the winter has been completed by State and Federal entomologists in most of the cotton belt States and the carry over in the majority is very high. In Florence County, South Carolina, over 4,500 live boll weevils per acre were found this spring. This is more than twice the average number found in the spring of 1955 and about 1½ times the average number found during the past 19 years. In the 19 years during which records have been maintained for Florence County only twice, 1950 and 1953, has the number of surviving weevils exceeded the count this spring. In six other South Carolina counties; Sumter, Darlington, Horry, Laurens, Claredon, and Orangeburg, counts averaged about 5,000 weevils per acre. This is almost 7 times the number of live weevils found in the spring of 1955.

In Georgia the State average was 390 live weevils per acre of trash. This was about 8 times the number found last spring. Samples were taken in six counties representing the northwest, north central, east central, and south parts of the State.

In Washington County, Mississippi, an average of 2,178 weevils per acre of trash survived the winter. This is about one third more than found in that county in 1955. In six delta counties, including Washington, the average this spring was 1,355 and in five hill counties, 1,065

(Continued on Page 76)

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per acre of surface trash.

Surface trash samples were taken in 12 North Carolina counties and an average of 1,815 live weevils per acre was found. This number is 7.6 times the average found in 1955.

Spring survival counts in Madison Parish, Louisiana showed over 3,600 weevils per acre. This is 1.8 times the number found in 1955 and 4.3 times the average for the past 20 years. Samples taken in nine other parishes of the State averaged over 1,800 live weevils per acre of trash. In five of the parishes counts were 3.6 times those of 1955. For all samples taken in the State the average spring survival was 2,925 boll weevils per acre of trash.

Counts were made from 5 southeastern counties in Virginia and the average number of live weevils found was 85 per acre of trash. This count is only slightly more than in 1955 and considerably less than the number found in the spring of 1954.

At Waco, Texas, about normal number of cotton boll weevils were present last fall. Since the winter was mild, entomologists expect about the same proportion of weevils to survive there as did in 1954, but probably considerably fewer than the number of survivors in the spring of 1955.

With the heavy carry over of cotton boll weevils in various areas, farmers should be alert and determine the condition as it exists on their farms as the season progresses. They should seek the advice of the County Agricultural Agent or other agricultural workers who are acquainted with local conditions and practices in order to determine the opportune time to initiate control practices.

Spotted Alfalfa Threat

THE spotted alfalfa aphid which was first reported in 1954 continues to be a serious alfalfa pest in some areas. It has been a problem this year in many areas throughout the eastern two-thirds of Oklahoma. Through the early part of April counties which have reported serious damage include: Logan, Caddo, Cleveland, McClain, Tulsa, Rogers, Mayes, Stephen, Garvin and others. Spraying for control of the aphid has been practiced in all sections. In some cases control practices have been abandoned because of the seriousness of the problem.

The southwestern counties of Missouri also report heavy infestations of the aphid, with light to heavy populations being reported from northwestern Arkansas counties where control measures have been undertaken. Control has also been necessary in some southeastern Kansas counties, especially Montgomery, Labette and Cherokee.

Rather general infestations of the spotted alfalfa aphid have been reported through early April in northwestern Louisiana parishes, but predators and parasites have apparently done a rather effective job in keeping the problem under control.

Reports of heavy infestations of the aphid have been received from Denton, Kaufman, Hunt, Delta, Brazos, Burleson, Grimes, and Houston Counties, Texas. Light to heavy infestations have also been reported from the north central Texas counties along the Oklahoma line.

The situation in Arizona seems to be lighter than in 1955, and it is the belief of entomologists there that the problem will not approach that of last year. Washington County, in southwestern Utah reported damaging populations in early April, with both airplane and ground spray equipment at work.

The pea aphid was also a serious alfalfa pest in some states during late March and early April. Arkansas reported damaging populations in about one-third of the alfalfa fields in the northwestern counties of the State. Spraying was underway in many sections of the southern half of Missouri where counts averaged 200-500 aphids per alfalfa crown in many fields. Very heavy populations were reported from northwestern Louisiana. Kansas had counts up to 1500 aphids per sweep in some areas of 11 southeastern counties checked. Scattered infestations required control. In Arizona the pea aphid was a problem only in the Salt River Valley.

During late March the brown wheat mite was heavy on wheat in parts of Kansas, Oklahoma and Texas. Greenbugs were also active on small grain in various areas of Texas, Oklahoma, Kansas, Missouri and Arkansas. In Louisiana, parasites and predators were keeping infestations down.

Other Insect Activity

IN early April green peach aphid was building up on lettuce in Maricopa County, Ariz. Threatening populations occurred on spinach on the Eastern Shore of Virginia. Florida reported this pest on tobacco beds in mid-March. The heaviest infestation of spider mites on strawberries in three years was recorded in eastern Virginia, and infestations were of concern on this crop in central Kentucky. Among the tree-fruit insects attracting attention in early April were aphids, which were hatching as far north as Pennsylvania and New Jersey, and mites, which may be worse than last year in New Jersey and which will cause damage in Idaho unless controlled. Although armyworms do not indicate a serious problem as yet this year, moth flights were reported as far north as Maryland, Kentucky, Illinois and Missouri by early April.

●

DDT, Systox Petitions Filed

Geigy Chemical Corp., New York, have filed a petition with the Food & Drug Administration proposing a tolerance of seven parts per million for residues of DDT in or on sweet potatoes and the fat of cattle, goats, sheep and swine. Geigy has also withdrawn its petition proposing a tolerance for residues of Diazinon.

Chemagro Corp., New York, has filed a petition proposing tolerances for residues of Systox as follows: 5 ppm in or on almond hulls; 1.25 ppm in or on grapes; and .75 ppm in or on almond meats, grapefruit, lemons, lettuce and pecans.

●

Tolerances for Melons, Beans

The Food & Drug Administration recently set a zero tolerance for dieldrin on a number of forage crops and certain melons and beans, and tolerances of .1 part per million, .25 part per million and .75 part per million in or on certain other specified fruits, vegetables and straw.

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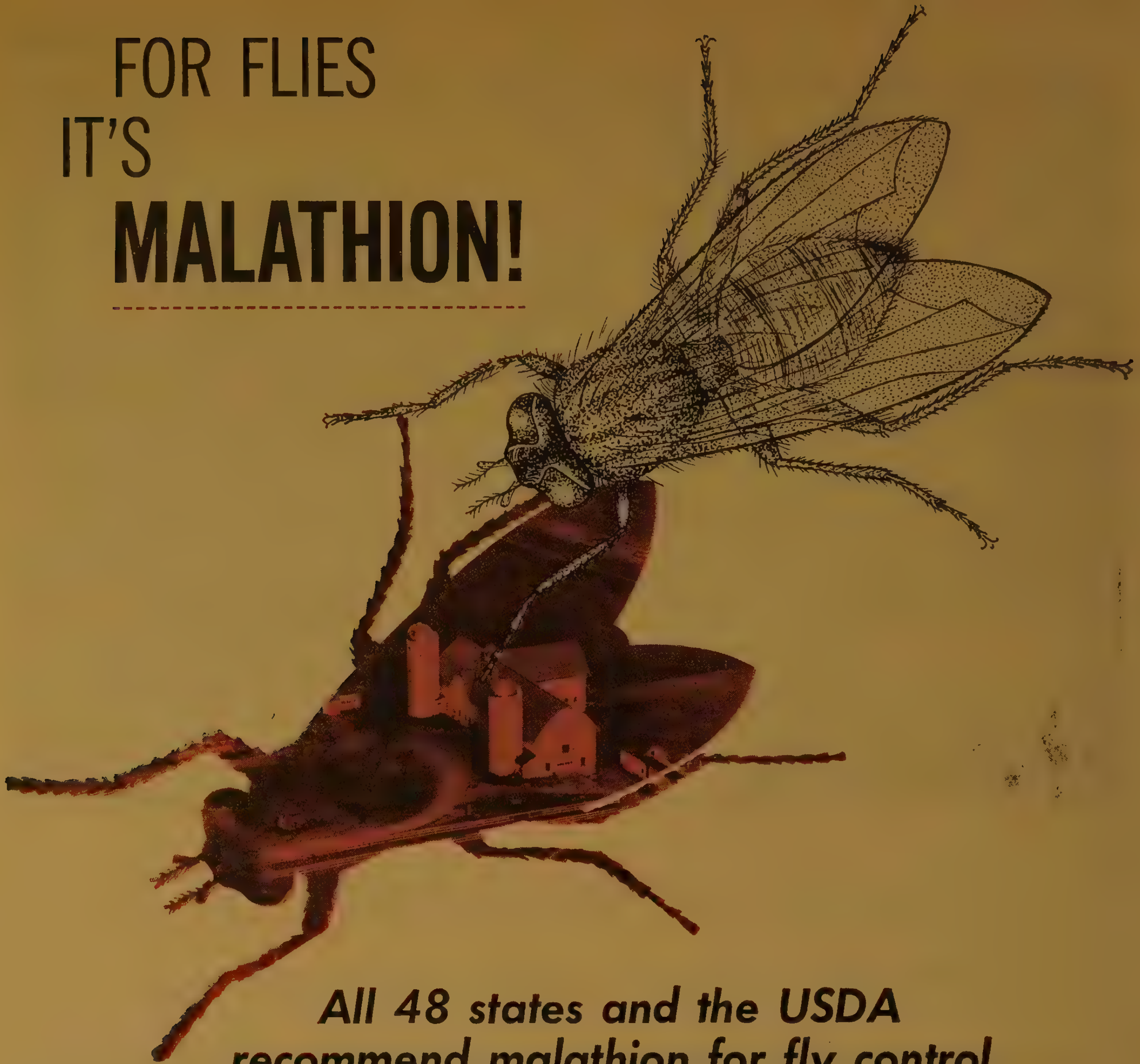

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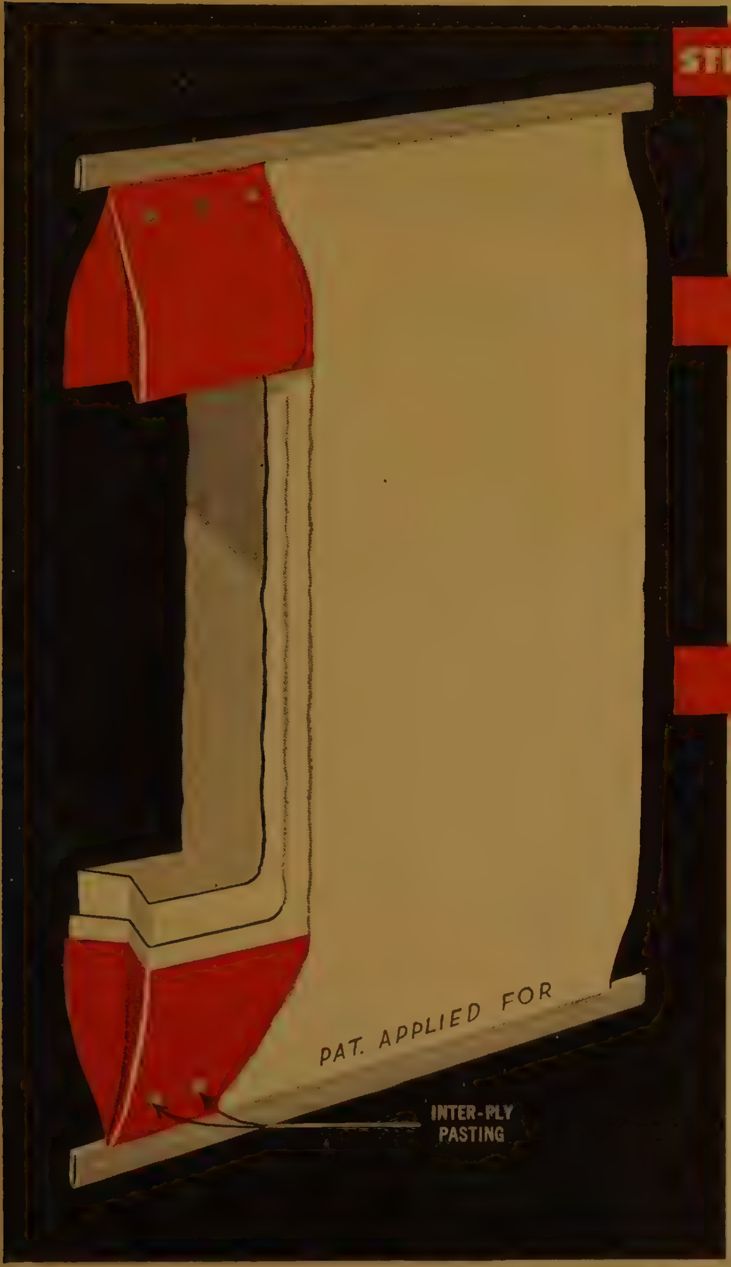

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New Bemis Strength-End Multiwalls, strengthened top and bottom where most sewn bag breakage is experienced, will cut packing troubles and costs for you.

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SUCCESSFULLY TESTED

Bemis Strength-End Multiwalls have been successfully tested in all sections of the country and under all climatic conditions. They have proved themselves for packing cement, fertilizer, chemicals, flour, salt.

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The reinforcement in Bemis Strength-End Multiwalls is a strip of sturdy kraft, several inches wide, running horizontally around the bag at the ends . . . anchored to the other walls so it works in conjunction with them . . . and adding greatly to the strength both at the sewing line and at the gusset corners. It's just plain, common-sense, balanced strength construction.

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Pear
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Blueberry
Cranberry
Strawberry
Grapes
Beans
Broccoli
Rutabaga
Cucumber
Squash
Melon
Tomato
Eggplant
Onion
Peas
Peppers
Potato

CROPS WITH A 7-DAY INTERVAL BETWEEN LAST APPLICATION AND HARVEST:

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Avocado
Dates
Peaches
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Cabbage
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Turnips
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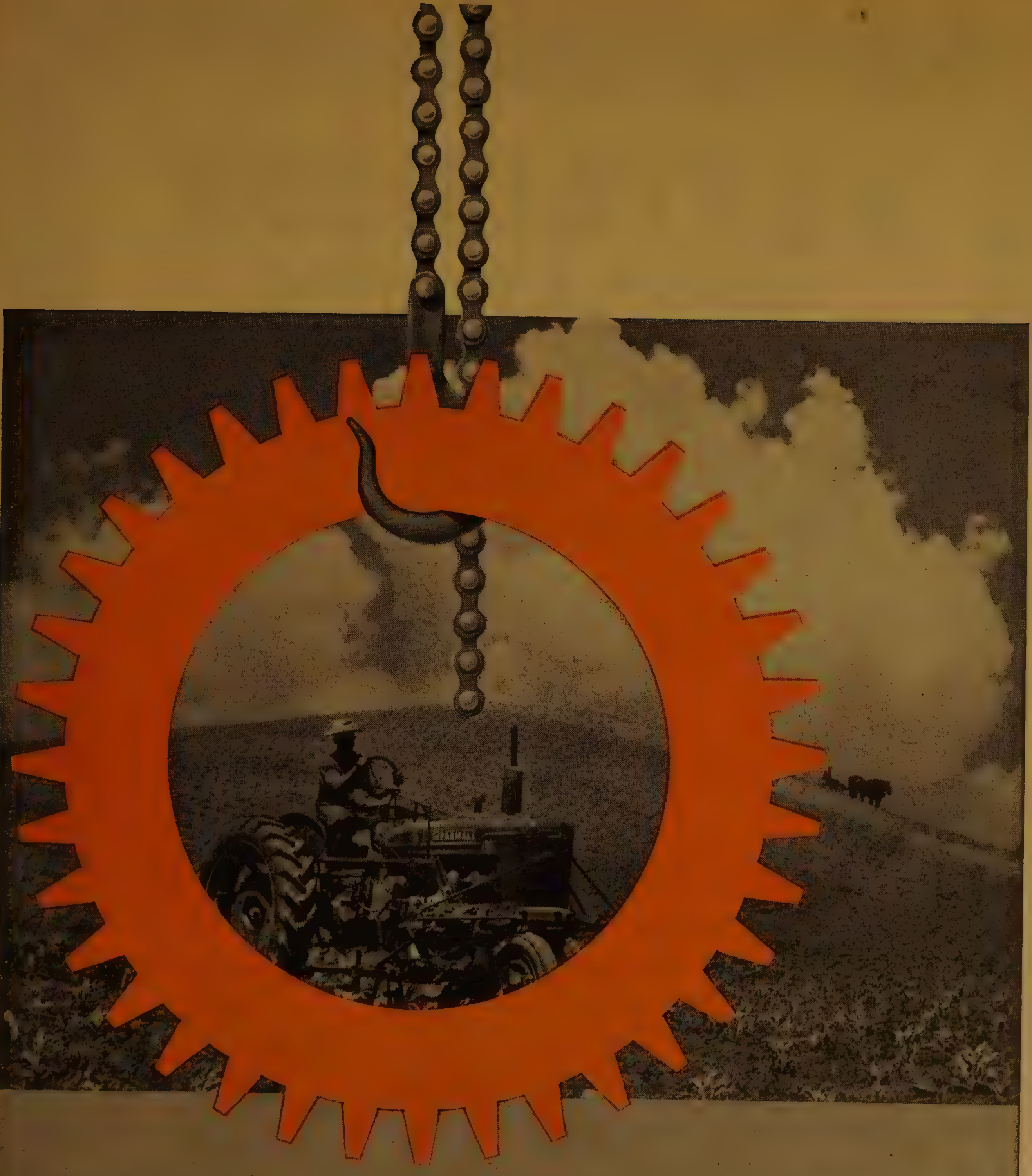

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INDUSTRY News

Ohio Pesticide Meeting

The annual summer meeting of the Ohio Pesticide School will be held at the Ohio Agricultural Experiment Station, Wooster, on August 14-15. The program will be expanded this year to encompass the field of control chemicals on those agronomic, horticultural, and forest crops that are grown in Ohio.

•

Fairfield Opens Atlanta Office

The Fairfield Chemical Division of Food Machinery and Chemical Corp., Baltimore, recently announced the opening of an Atlanta office and warehouse facilities. Robert B. Henderson has been appointed director of the office which will serve North and South Carolina, Georgia, Alabama and Florida. For the past several years Mr. Henderson has worked on special technical sales and field development assignments for Fairfield.

•

$15 Million Feritlizer Plant

A $15,000,000 high-analysis fertilizer plant will be built at the new Bayou Casotte harbor development in Pascogoula, Miss., by the Mississippi Chemical Corp., which has operated a farmer-owner hydrogen fertilizer plant at Yazoo, Miss. for the past six years, it has been announced by C. W. Whittington, president, Mississippi Chemical Corp.

When completed, the new $15,000,000 fertilizer plant will produce up to 15,000 tons of high nitrogen content fertilizer annually, according to officials of the corporation. It will employ 150 persons. $4,000,000 of the stock in the new fertilizer plant must be pledged by farmers who will take the output of the plant, according to Mr. Whittington.

NPFI Names Williams

Dr. M. S. Williams, specialist in charge, extension farm management and marketing at North Carolina State College since 1954, will become chief economist of the National Plant Food Institute, beginning July 1, Dr. Russell Coleman, executive vice president of the Institute, announced early last month.

As chief economist for the Institute, Dr. Williams will develop programs designed to focus attention on the economic value of using fertilizers properly.

"We are pleased that Dr. Williams is joining our staff, for we recognize the need for closer cooperation with the nation's agricultural economists, particularly at the land-grant college level, in emphasizing the economic research values of plant foods in relation to the other major factors entering into a sound land management program," Dr. Coleman said.

•

Petrochemical Plant To Be Built

Petroleum Chemicals, Inc., Lake Charles, La., owned jointly by Continental Oil Co. and Cities Service Co., has announced that construction will start in a few weeks on a $12,500,000 petrochemical plant, which will produce anhydrous ammonia for use primarily as a fertilizer.

The plant, expected to be completed in the fall of 1957, will produce 100,000 tons of ammonia annually and will employ about 100 men. The major portion of the production will be sold as fertilizer but a small amount will go to industrial plants for use in making plastics and other petrochemical products. By-product hydrogen, the principal raw material for ammonia, will be supplied to the new installation by the Conoco and Cities Service refineries near Lake Charles.

•

Lilly Agr. Research Program

A $3 million agricultural research center will be built by Eli Lilly & Co. on 417 acres at Greenfield, Ind., present site of the pharmaceutical maker's biological laboratories. Construction will begin this summer, and one to two years will be required to complete the project, which will include some 10-14 building units.

The agricultural program will cover nearly all phases of agriculture: animal nutrition, insects and insecticides, plant nutrition and diseases, weed control, veterinary medicine, etc.

The center itself will include the following: administration building, plant disease laboratories, greenhouses, veterinary research laboratories, cattle feeding barn, swine farrowing house, swine nursery, swine research barn, caged layer house, broiler plant, and centrally located feed-mixing plant.

Dr. T. P. Carney, is Lilly's vice president in charge of research, development and control.

C-VPFA Spring Meeting at Myrtle Beach, South Carolina, May 7-9

THE spring meeting of the Carolinas-Virginia Pesticide Formulators Association scheduled for May 7-9th, at the Hotel Ocean Forest, Myrtle Beach, South Carolina, includes a program of practical discussions for the pesticide formulator. J. M. Maxwell, Maxwell Insecticide Co., Raleigh, presiding at the opening session will introduce I. D. Carter, Esso Standard Oil Co., who will discuss the question of "What is Good Selling?". Kenneth R. Holden, Chemagro Corp., will report on "New Compounds . . . Their Development through Research"; and Wayne T. Showalter, public accountant, will review "Sound Cost Accounting Practices."

A highlight of the three-day meeting will be the final session, at which members have been invited to bring problems and questions for discussion at an "Open Forum."

W. P. Crown, Carolina Chemicals Inc., is president of the Association, and W. R. Peele, W. R. Peele Co., Raleigh, is secretary-treasurer.

Johnson Pres. Ga. Entomologists

Harry E. Johnson, president of the Triangle Chemical Co., Macon, Ga., has been elected president of the Georgia Entomological Society at its recent meeting.

C. M. Beckham, University of Ga., was elected vice president; H. O. Lund, University of Ga., was elected secretary-treasurer; and Oliver I. Snapp, USDA, Fort Valley, was named historian. The society, organized in 1937, currently has a membership of 150.

•

Stauffer Advances Kincannon

Stauffer Chemical Co. has announced the appointment of Wayne Kincannon as manager of the company's plant at North Little Rock, Arkansas. This plant manufactures pesticides, fungicides and other agricultural chemicals.

Mr. Kincannon, who joined Stauffer last May, has previously been associated with the company's Lubbock, Texas operations. Prior thereto he was a teacher of vocational agriculture and, for two years, a salesman of agricultural chemicals in West Texas and New Mexico.

•

USDA Clears Premerge Use

The use of "Premerge" for weed control in mint has been cleared by the Registration Unit of the Pesticide Regulation Section of the United States Department of Agriculture. Premerge is a dinitro weed killer formulation which controls weeds by contact action and by residual soil effect, for four to six weeks. It is offered by Dow Chemical Co., Midland, Mich., and suggested for potatoes, beans, soybeans, corn, peas, alfalfa, clover, and several bulbs.

•

New Ohio Fertilizer Plant

Tyler Grain & Fertilizer Co., Wooster, Ohio announctd last month plans to build a new fertilizer plant at Weilersville, Ohio. The plant will incude a new storage building, batching hoppers and granulation plant. High analysis granular fertilizers with a particle size range between 6 and 16 mesh will be manufactured at a rate of 20 tons per hour. Construction is to start at once with a completion date set for July in order to be in operation for the fall fertilizer season.

•

Miller Elects New Officers

Miller Chemical & Fertilizer Corp., Baltimore, announced recently the election of L. W. Cameron as president. Mr. Cameron had served as company treasurer for several years. Roger W. Cohill, former sales manager of the insecticide division, was named vice president and general manager, and W. D. Ashmore has been named treasurer.

Other changes include the appointment of C. E. Carr as assistant treasurer, Howard F. Long, assistant secretary and W. D. Wilner and Frank R. McFarland as assistant sales managers.

•

New Pennsalt Dist. Sales Mgr.

Appointment of Donald E. Hope to new position of agricultural chemicals district sales manager for Northeastern and Mid-Atlantic states was recently announced by Pennsylvania Salt Manufacturing Co. of Washington.

Mr. Hope joined Pennsalt in 1950, at which time he was assigned to the Philadelphia office. Later he served as agricultural chemicals sales representative in the Eastern states until appointment to the present position.

•

Changes in "Crag" Personnel

Three personnel changes are announced by the Crag Agricultural Chemicals Division of Carbide and Carbon Chemicals Co., a Division of Union Carbide and Carbon Corp., New York.

Robert E. McKenzie, formerly area representative in New York and New England, has been transferred from the sales group to the technical development group. Edwin M. Miller has joined the sales group for Crag agricultural chemicals in the New York office. Francis A. Pastor, a graduate of Louisiana State University, is now with the sales group for Crag agricultural chemicals in the New York office.

Greene of NPFI Joins Ashcraft

James S. Greene, assistant agronomist for the National Plant Food Institute, left the organization April 20 to join Ashcraft-Wilkinson as its sales representative in Minnesota, Iowa and Missouri.

Mr. Greene, who has been associated with the former National Fertilizer Association and the National Plant Food Institute since October 1954, will be headquartered in Des Moines, Iowa. He is a graduate of the University of Missouri, with a Bachelor of Science degree in Agriculture and is a veteran of the Korean war. He is a statistician, general agronomist, and handled a major portion of the audio visual education program as an employee of the Institute.

•

See High Boll Weevil Damage

"The boll weevil is likely to get the biggest head start in history in developing its attack on the 1956 cotton crop," according to a recent notice by the National Cotton Council. The report states that barring some heavy sieges of cold weather, it appears almost certain that more than twice as many weevils will have survived the winter than in the previous record year of 1950.

The pending infestation traces back to huge weevil buildup last summer and fall . . . and the fact that an abundant food supply was available to the pests right up until frost.

The Cotton Council is urging farmers to keep close check on their fields and be prepared for application of control measures . . . he should not wait, they say, until midsummer to see what the weather may be.

•

Calif. Agricultural Forum

The Central California Agricultural Forum scheduled for April 26th, at the Hacienda Motel, Fresno, Calif., featured a series of discussions on weed control in citrus, trees, aquatic plants, and vines, together with reports on flood control, irrigation, and other water problems. Another talk attracting considerable interest was that on a "Permit system for using hazardous chemicals in agriculture" by Charles Dick, State Department of Agriculture.

National Plant Food Institute Announces Program for June Conf.

OUTSTANDING leaders in the field of government, industry and agricultural communications will be heard at the second annual convention of the National Plant Food Institute at the Greenbrier, White Sulphur Springs, West Virginia, June 10-13, 1956. A record attendance of more than 1,000 persons is expected by officials of the Institute.

Senator J. W. Fullbright (D-Ark.), chairman of the Senate Committee on Banking and Currency, and internationally-known in the field of foreign affairs, will be the principal speaker at the June 12 session.

A panel on salesmanship will be featured at the opening session on June 11. The speakers will be: Dr. J. M. Bohlen and Dr. George M. Beal of Iowa State College, who will make a visual presentation of the results of an extensive survey on "Who Influences the Farmer," and Glenn R. Fouche, president of the Stayform Co., Chicago, who will speak on "Dramatize Your Selling."

John Ott of Ott Pictures, Inc., Winnetka, Ill., nationally-known motion picture producer and authority on time-lapse photography, will present a movie on "How Flowers Grow," on June 11 and a movie on "Seeing Plants Feed" will be presented to the general session on June 12.

Joseph A. Howell, president of the Institute, will preside at the sessions. He and other staff members will report to the membership on "One Year of Service to Our Industry" on June 11. Other outstanding features at the June 12 session will include:

Showing of the Institute's new film, "What's In The Bag"—a motion picture featuring the technology of fertilizer production in a down-to-earth presentation. Presentation of the "Soil Builders Award for Editors" to winners of the Institute's annual contest sponsored with approval of the American Agricultural Editors' Association.

The annual business session of the Institute will be held on June 12, at which officers will be elected and 12 members named to the board of directors. Meetings of the board of directors will be held on June 10 and on June 13.

•

Pacific ESA to Berkeley

Dr. Walter Carter, chairman, Pacific Branch ESA, recently announced that the 40th annual meeting will be held June 26, 27, 28, 1956, at Berkeley, California. Convention headquarters will be at the Hotel Claremont, Ashby and Claremont Avenues, Berkeley, California.

Program chairman, Dr. Woodrow W. Middlekauff reports the deadline for abstracts from members interested in submitting papers is May 10, 1956. These should be sent to Dr. Middlekauff at the Department of Entomology and Parasitology, University of California, Berkeley. In addition to the usual fine group of submitted papers, the following invitational papers have been arranged by the program committee:

Arthropod transmission of disease pathogens

Undergraduate training in entomology

The Miller amendment

Use of radio active isotopes in entomology

Use of audio-visual aids in entomology

Fly control in California

Theory and use of glossary in entomological research.

A new feature this year will be an insect photo salon. Branch members have already received an announcement regarding this section and outlining the two picture categories—Black and White; and Color. Photographs of insects (including ticks, mites, spiders, etc.) will be considered for awards, judging to take into account the technical and photographic excellence; Entomological interest and usefulness. Pictures by branch members may be submitted at any time up to June 20th.

•

New Spencer NH_3 Facilities

New facilities for the production of aqua ammonia and concentrated nitric acid have been announced for Spencer Chemical Co.'s Henderson, Ky. Works. The new additions will permit greater diversification of the ammonia production at Henderson; however, no increase in ammonia capacity is planned. The aqua ammonia unit is under construction and scheduled for completion by May 1.

Plans for the concentrated nitric acid facilities are still in the design stage, with construction scheduled to begin in October and completion expected about the first of the year. The new facilities will produce up to a 68% nitric acid as compared with the 55% acid now being made by the present units at Henderson. Nitric acid storage, blending, truck and car loading facilities will complete the project.

The Henderson Works has been operated by Spencer since 1950 when the plant was purchased from the government. The new facilities will complement the anhydrous ammonia, nitric acid, and ammonium nitrate solutions now produced at this location.

•

Curtis Named Plant Manager

American Potash & Chemical Corp., has announced the appointment of Henry S. Curtis as plant manager of the company's Henderson, Nev., subsidiary.

Curtis comes to the Nevada firm from Monsanto Chemical Co. at Texas City where he was administrative assistant to the head of the engineering department. Previously he served as manager of production and engineering at Diamond Alkali Co.'s agricultural chemicals plant, Houston, Tex. Prior to joining Diamond Alkali in 1951, he was production superintendent of Naugatuck Chemical Co., Painesville, Ohio, following service with the Glenn L. Martin Co. as plant manager of its chemical division, also at Painesville.

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Chairman-elect C. E. Mickel, left, University of Minnesota and chairman, H. Gunderson, Iowa State College, discuss program arrangements; secretary-treasurer Roy W. Rings, third from left, of the agricultural experiment station, Wooster, Ohio, and J. J. Davis, head of the entomology department at Purdue.

New officers of the North Central Branch of ESA: D. A. Wilbur, Kansas State College, chairman-elect; Curtis W. Wingo, University of Missouri, secretary-treasurer; C. E. Mickel, head of the University of Minnesota entomology departman, chairman; and Roy Rings, Ohio State University, new member of executive committee.

North Central ESA Elects Mickel as President

C. E. MICKEL, head of the University of Minnesota entomology department, was named president of the North Central Branch of the Entomological Society of America during the organization's 11th annual conference at Purdue University, March 28-30. He succeeds Harold Gunderson, extension entomologist of Iowa State University.

Selected as chairman-elect was D. A. Wilbur, Kansas State College entomologist, who will become chairman of the branch in 1957. Curtis W. Wingo, University of Missouri, was named secretary-treasurer, and Roy Rings, research entomologist at the Ohio State agricultural experiment station, was elected as the new member of the executive committee.

Two sessions, one on extension entomology and the other on the European corn borer, held the interest of the 350 entomologists from 14 states, following which tours and group meetings brought the three-day conference to an end.

During a session on corn borers, agricultural scientists agreed that in most cases granular formulations of insecticides to control the borers are equally as effective and often superior to sprays.

Preliminary results of experiments on the effect of soil insecticide applications on corn borer were given by G. T. York, Iowa State College, and W. H. Luckman, University of Illinois.

B. E. Montgomery, Purdue entomologist, was a section leader of a special group which met to discuss agriculture. Among the speakers was James Harding, Purdue entomology student.

B. A. Porter, head of the fruit insect section of the entomology research branch of the U.S.D.A. in Washington, D.C., and president of the national ESA, appeared on a program panel discussing the reliability of label claims.

Dean H. J. Reed, director of agricultural activities at Purdue, was guest speaker at the annual banquet, and J. J. Davis was toastmaster. George E. Gould, Purdue entomologist, was chairman of the local arrangements committee.

The first meeting of the north central group was organized in 1921 by J. J. Davis of Purdue University, who is retiring this July (see *Agricultural Chemicals,* March, 1956). Illinois, Indiana, Ohio and Missouri were represented at this first meeting. In 1946, the group decided to affiliate with the American Association of Economic Entomology (now Entomological Society of America) and J. J. Davis was elected the first president.

B. A. Porter, left, president, the Entomological Society of America, and George E. Gould, Purdue entomologist, local arrangements committee chairman for the conference.

New Chemical Fights Mites

Red spider mites, which have been cutting down Indian tea growers' yields for years, are being combatted this season by the use of Aramite, well known miticide made by Naugatuck Chemical division, U. S. Rubber Co., Nargatuck, Conn.

For the past three years the chemical has been tested at the Tocklai Experiment Station of the India Tea Association and it has been recommended to growers by the association this year.

Raymond Names Clements

J. R. Clements has been appointed vice-president and general sales manager of the Raymond Bag Corp., according to an announcement by F. D. Gottwald, president of the Albemarle Paper Manufacturing Co. of Richmond, Va., parent company of Raymond.

Mr. Clements was formerly general sales manager of the Multiwall Bag Division of Albemarle. Raymond Bag Corp. is the newly formed Division of Albemarle following their purchase of the old Raymond Bag Co. of Middletown, Ohio.

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Illinois Agronomists Discuss

WEED CONTROL FORMULATIONS AND PRACTICES

By H. H. Slawson

AGRONOMISTS at the Illinois College of Agriculture are suggesting a conservative, "go slow" approach to use of 2,4-D and trace mineral dust mixtures to control weeds. Considerable excitement has been stirred up in Illinois recently by claims that mixtures of herbicide and minor elements give good weed control, and in addition stimulate crop growth and increase yields. This, says a statement from the agronomy department, has not yet been determined experimentally at Illinois or any other experiment station.

To correct frequent misquotation on this matter, the release states that preliminary tests by Dr. F. W. Slife of the dept. of agronomy at Urbana, "indicate that the dusts are about equal to regular 2,4-D formulations in ability to control weeds. Thus, if the price per pound of 2,4-D acid supplied by the dust is as low or lower than that supplied by other formulations it might well be profitable from the weed control standpoint."

As to the status of minor elements in the mixture, the statement says an extensive study has shown that Illinois soils are well supplied with iron, manganese, copper, zinc and molybdenum. Where boron deficiencies are shown by soil testing, applications of at least 20 lbs. of borax per acre are recommended. This, it is pointed out, is several times the amount supplied by the average application of an over-all dust type-mixture.

"Where trace elements are needed," the statement continues, "the price per lb. of the element in question should determine whether it can best be provided by 2,4-D trace mineral dust mixtures or by other commercial carriers.

On the claim that the mixture does have a stimulating effect, the statement cites results of one year's tests at Illinois and says, "time and extensive physiological tests and field trials may determine whether many of the theories now expounded are facts."

•

Ample '56 Pyrethrum Supplies

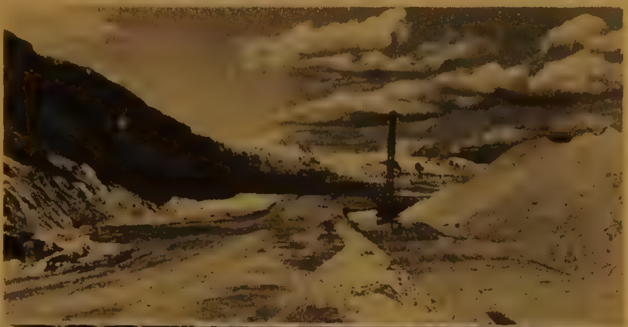
Crop forecasts from British East Africa and the Belgian Congo, as reported by African Pyrethrum Development, Inc., New York, indicate that American manufacturers of agricultural and household insecticides should be able to count on ample supplies of pyrethrum for the current year. Producers estimate that upwards of 8,000,000 lbs. of pyrethrum flowers, or the equivalent in extract, will be shipped to the American market this year. The prospect of adequate supplies of pyrethrum this season contrasts with the experience of the past ten years, in many of which demand has exceeded supply.

Typical Operations in Mining and Processing Pesticidal Clays

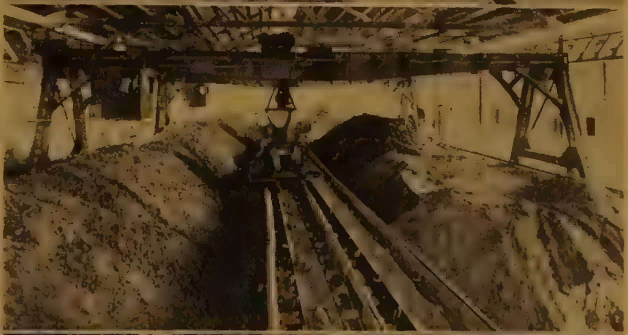
About 95 per cent of a granular pesticide is an inert carrier or base material, and because it is such a high percent of the product has a very marked effect on the character of the product.

Clays intended for use as pesticide carriers undergo drying, crushing, sizing and screening operations before they are ready for the pesticide manufacturer.

The following photographs show a mine, and typical operations in storage and drying at Minerals & Chemicals Corp., Menlo Park, N. J., makers of Attaclay," one of the well known pesticide carriers.



Typical Attapulgite mine gives idea of large extent of workings. Selective mining assures best products for use as granular pesticide carriers.

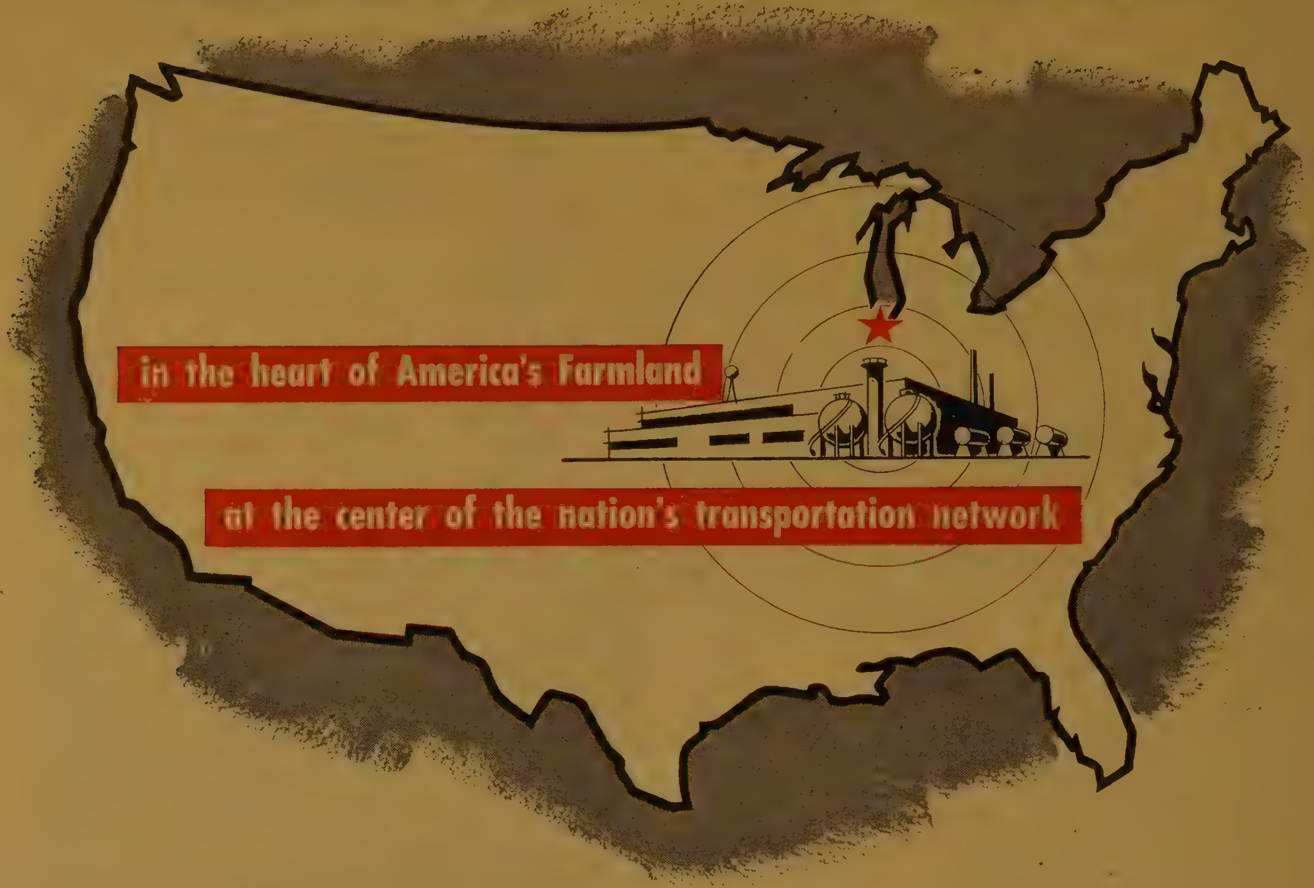


Where raw clay is stored as it comes from the mine.

Drying equipment to make granular carrier includes a battery of direct-fired rotary kilns.

A new source for nitrogen chemicals

SINCLAIR WILL SERVE THE MID-WEST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at the center of the nation's transportation network

Strategically located in Hammond, Indiana, this ultra-modern plant will soon be on stream — producing high purity anhydrous ammonia and nitrogen fertilizer solutions for agriculture and industry.

The central location of this plant is of prime importance to you. It means *fast, low cost delivery* of your nitrogen needs via Sinclair's fleet of tank cars and tank trucks. Moreover, vast storage facilities will enable Sinclair to supply you with top quality products during your busiest periods.

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Tolerance Extension to July 22

The Food & Drug Administration has granted another extension of the date at which pesticide manufacturers must meet the residue tolerances of the Miller Pesticide Law. The extension applies to the following chemicals: carbon bisulfide as a grain fumigant; carbon tetrachloride as a grain fumigant; chloropicrin as a grain fumigant; DDT, in or on meat and sweet potatoes, ethylene dibromide as a grain fumigant; malathion on citrus and "MGK 264" in fly sprays.

The extension is made to July 22 on the above products, and is granted because nonseasonal uses are involved, and because some petitions are involved which have been recently submitted, but not yet processed.

•

Philipp Bros. President

Kenneth D. Morrison has been named vice-president of Philipp Brothers Chemicals, Inc., New York. He was previously general manager of the Agricultural Chemicals Division.

Philipp Brothers Chemicals, Inc. are importers, exporters and distributors of heavy chemicals.

•

Riverdale Announces Move

Riverdale Chemical Co., formerly of Harvey, Ill., announce the opening of their new plant and office at Chicago Heights, Illinois, as of May 1.

In their new quarters, Riverdale will have some 50,000 sq. ft. of operating space, allowing an increase of better than 50% in production. Primary sales effort is concentrated in 17 mid-western states and handled mostly through distributors and jobbers. They manufacture agricultural chemicals exclusively—having a complete line which includes chemicals for weed, insect and brush control. Riverdale is introducing their new Solvent-Free DDT Granules to the market this month.

This year Riverdale's sales will top the three million dollar mark, and during the peak season they will employ some 75 people.

Sherry Heads Chem. Ins. Corp.

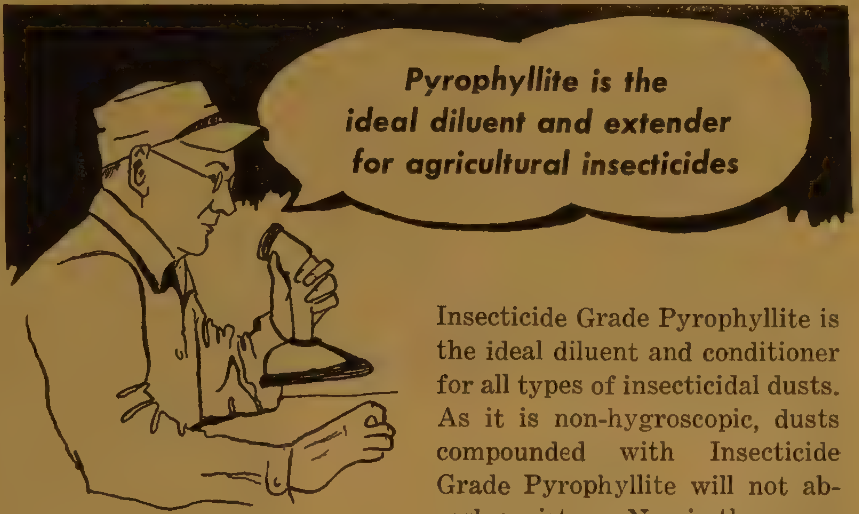
Chemical Insecticide Corp., New York, announced late last month the election of Albert F. Sherry as vice president of the firm. Mr. Sherry has been manager of the firm's Metuchen, N. J. plant for four years. In his new post he will be in charge of manufacturing and will coordinate the expansion program currently underway.

•

Starr Rep. for Trinidad Ryania

Trinidad Ryania Corp. of Upper Montclair, N. J., established to promote use of ryania insecticides, has named Donald F. Starr, consultant on insecticides, as their representative in the United States.

Trinidad Ryania Corp. will obtain its supply of ryania from people licensed to cut ryania on government lands which represents about 98% of the supply from Trinidad. The corporation has plans to encourage tests on ryania application on sugarcane, apples and corn in 1956. The program to increase use of ryania has already been started with tests in Louisiana.


Pyrophyllite is the ideal diluent and extender for agricultural insecticides

Glendon's Insecticide Grade Pyrophyllite

Wt per cubic foot—30 lbs

92 to 95% will pass a 325 mesh screen

pH range of 6 to 7

Non-alkaline and chemically inert

Average particle size below 5 microns

Insecticide Grade Pyrophyllite is the ideal diluent and conditioner for all types of insecticidal dusts. As it is non-hygroscopic, dusts compounded with Insecticide Grade Pyrophyllite will not absorb moisture. Nor is there any tendency even during extended storage, for the carrier to separate from the active ingredients.

Insecticide Grade Pyrophyllite has superior adhering properties, and because it is difficult to wet, it holds well on the plant leaves even during rain. When used as a carrier for products to be dusted by airplane, it settles rapidly, minimizing drift, waste of materials, etc.

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Pyrophyllite Company

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Greensboro, N. C.

Plant & Mines, Glendon, N. C.

"The bag lasts longer than the fertilizer"

says Sydnor Y. Priddy, president of Charles W. Priddy & Co., fertilizer manufacturers of Norfolk, Virginia. "Farmers want their fertilizer in burlap so they can use the bags to pack their own produce after they've used the fertilizer. Burlap bags have more uses around a farm than you can name.

"We know that burlap is safer for shipping fertilizer than any other kind of bag. No matter how they go—by train or truck, they won't chafe, break or tear."

Pack your fertilizer in burlap bags for easier handling in the plant and better protection during shipping. Use "bag appeal" to sell more fertilizer to farmers in your area.

Just ask your own customers—

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Is strong — takes dragging, dropping, man-handling — any tough job on the farm.

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Laughs at sudden showers — wetness or dampness can't weaken it.

Saves money — extra value from re-sale and re-use.

Saves storage space — stacks to any height without slipping.

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Has 1000 uses — always in demand on the farm (popular with farm wives, too!)

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Tank (in foreground) at Mississippi Chemical Corp., stores ammonium nitrate during shutdown of prilling facilities, thereby permitting continued processing of nitric acid into ammonium nitrate solution. Prilling tower is in background.

Prilling at Mississippi's Yazoo City Plant

A new storage tank is expected to offer flexibility of operation at Mississippi Chemical Corp.'s ammonium nitrate prilling plant at Yazoo City, Miss. The tank is 78 ft. in diameter and 30 ft. high; and has a capacity of 25,000 bbl.

The tank serves two main purposes: to store ammonium nitrate in liquid form during periods of partial plant shut-down and also to store it in the off season so it can be processed quickly in the high-demand season.

In the prilling plant (in the background), nitric acid is neutralized with anhydrous ammonia to form aqueous ammonium nitrate solution. The neutralizing reaction generates enough heat to concentrate the solution to about 83% ammonium nitrate. The nitrate solution is further concentrated to about a 96% solution in a Conkey climbing-film evaporator located near the midway section of the tower.

The 96% ammonium nitrate solution is then sprayed down through the tall, square prilling tower against a countercurrent stream of air. The nitrate solidifies into 12- to 14-mesh pellets, or prills, which collect in the bottom of the tower.

Prills are dried in shell-type dryers, coated uniformly with diatomaceous earth, and bagged. The prilled ammonium nitrate, with a guaranteed nitrogen content of 33.5%, is marketed for use as fertilizer.

While the manufacture of both nitric acid and the ammonium nitrate solution is relatively simple, corrosion complicates the rest of the process. The corrosive effect of ammonium nitrate, as in other plants with mechanical equipment, requires periodic shut-downs of the prilling facilities for maintenance purposes. Shut-downs may last for a week or more. During these periods, the plant can continue processing nitric acid into ammonium nitrate solution and storing it in the stainless-steel tank.

When the whole plant is again in operation, the prilling tower handles the total ammonium nitrate out-

DO YOUR DUSTS STICK TO THE LEAF?

They do if they contain Barden Clay. Barden sticks through rain or shine! Tests show 44 to 72% retention of Barden-extended insecticides after three rainfalls in seven days... 51 to 100% retention in five days without rain! Barden Clay's extra-fine particle size—90% less than two microns—gives the utmost in toxicant dispersion—and Barden's very high retentive powers hold the toxicant to the leaf.

It *costs no more* to be sure with Barden Clay, the scientifically-prepared diluent. Add *extra power* to your product ...*extra punch* to your sales. Use Barden Clay. Samples can be had on request.

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World's Largest Producer
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✓ Lower abrasion
✓ Better coverage
✓ Better retention
✓ Higher mortality
✓ Greater uniformity
✓ Maximum economy

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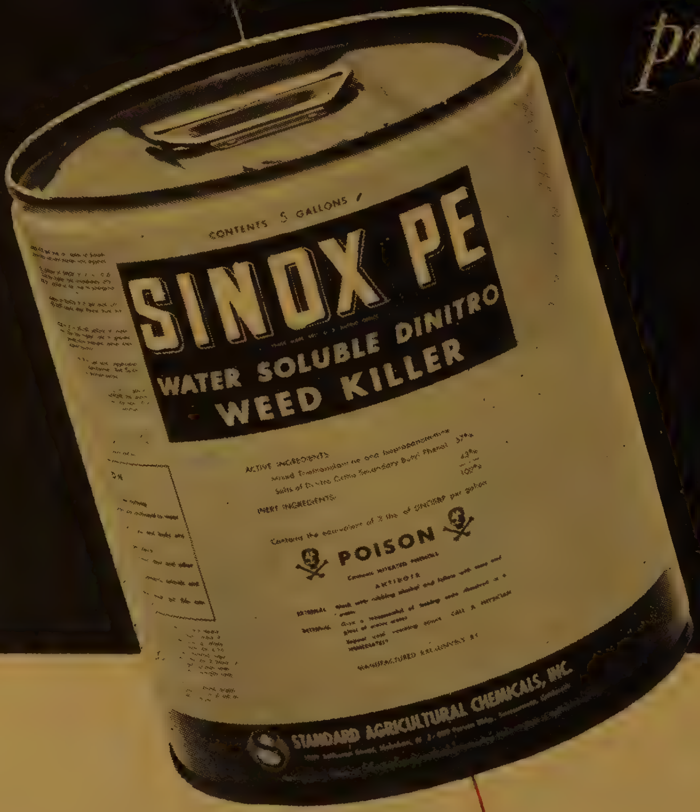
pre-emergence spray



Growers everywhere are switching to SINOX PE for their pre-emergence spraying of beans, sweet corn and potatoes, and early summer treatment of alfalfa and clover, as well as for controlling chickweed in fall seedings of these two legume crops. SINOX PE is a hot selling item because it is an economical, labor-saving farm chemical that gives crops a weed-free start. When used as a pre-emergence spray, early, slow, costly cultivations are eliminated. Traffic in the field is reduced, and the soil compaction problem is alleviated.

Join the growing group of agricultural chemical dealers throughout the country who have profited by STANDARD-izing on our popular line of products!

SINOX GENERAL. Sinox General is the widely accepted desiccant for seed alfalfa, clovers, milo, flax and Sudan Grass. Also, it is an excellent potato vine killer.

ELGETOL. Dealers in areas where orchardists have adopted chemical blossom thinning for their apple crops find that Elgetol dinitro compounds are a fast moving item because of the cost advantage over hand labor.

it pays to Standard-ize

standard agricultural chemicals, inc.

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put plus nitrate from the storage tank to prepare for a future shut-down period. The tank also can store about 5,000 tons equivalent ammonium nitrate, which later is prilled to supply fresh pellets during the high-demand season.

The outside of the storage tank is insulated with foam glass, then covered on the sidewalls with light-gage aluminum to retain the insulation and to improve the appearance of the tank. Insulation reduces the temperature of the nitrate solution, which would normally precipitate at the high process concentrations and the temperatures experienced in the Mississippi area. The solution is continually recycled through heaters to maintain a uniform temperature of 250°F.

The aluminum siding itself resists corrosion from ammonium nitrate to a limited degree. Some chemical companies have even built aluminum storage tanks. Mississippi Chemical. however, selected stainless steel because of its greater corrosion resistance to ammonium nitrate and the possibility of storing nitric acid in the tank. It is expected that a minimum amount of maintenance will be required on the tank.★★

•

Kraft Appoints Burgers

E. Burgers, Jr., formerly sales representative in the St. Louis area for Kraft Bag Co., has been appointed sales promotion manager, with headquarters in New York. Mr. Burgers' duties include sale and promotion of the company's automatic open mouth bag filling machine.

•

Retires As Grace Chairman

Charles E. Wilson is retiring as chairman of the board of directors of W. R. Grace & Co. The retirement will become effective on May 10th, date of the annual meeting of the stockholders of the company.

•

Am Potash Sales Meeting

The 1956 annual sales meeting of American Potash & Chemical Corp. was held recently at company headquarters at Los Angeles and included tours of various company facilities at Vernon, Whittier and Trona, Calif., Henderson, Nev., and San Antonio, Tex. Twenty-eight representatives from various parts of the United States and London attended the meeting, which was presided over by William J. F. Francis, vice president in charge of sales.

New Bemis Bro. Bag plant in Flemington, N.J., for the manufacture of waterproof paper-lined laminated textile bags and burlap bags. Floor area of the plant is 30,000 sq. ft.

Handbook of

INSECTICIDE DUST DILUENTS AND CARRIERS

250 Pages

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THE original publication "Properties and Commercial Sources of Insecticide Dust Diluents and Carriers" prepared by T. C. Watkins and L. B. Norton of Cornell University has been brought up to date and completely revised by Drs. Weidhaas and Brann. The new edition contains commercial information as well as data obtained in research conducted at Cornell University, Ithaca, New York.

The book is bound in a flexible leatheroid cover, for handy, practical use.

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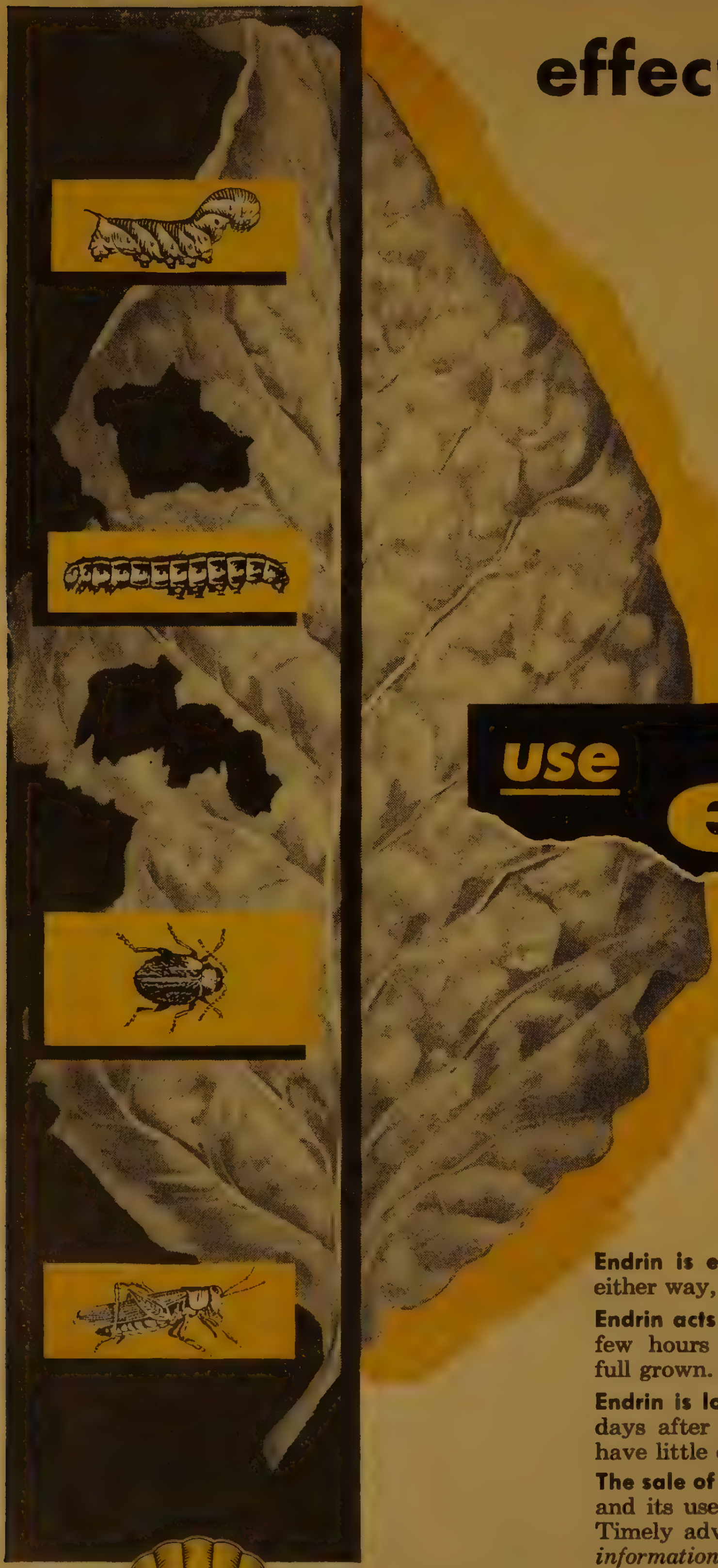

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Hercules Adds 5 to Ag. Div.

The addition of five men to the technical service and sales staff of the Agricultural Chemicals Division of Hercules Powder Co. was announced recently when Hercules reported on the establishment of a new sales office in Greenville, Miss., under the direction of Mr. Leonard V. Edwards, who was formerly located at Hercules' Dallas office.

The five additional men have been assigned as follows:

Arthur A. Chadwick, technical assistant, advertising department, Wilmington; Marvin H. Frost, Jr., technical service representative, Los Angeles.; Richard D. Griffith, technical service representative, Greenville, Miss.; Ernesto J. Groskorth, technical service representative, export department, San Salvador, El Salvador; Thomas J. Walker, Jr., technical service representative, Wilmington.

•

Am. Potash Lists Sales Changes

American Potash & Chemical Corp. recently announced changes in its Western sales department. Ralph Hoh, former supervisor of soda ash sales, has been named manager of soda ash sales. Trevor Steele has been transferred to agricultural chemicals sales. He was formerly Pacific Northwest regional agronomist for the company.

Frank McGrane has been named manager of western potash sales to fill the post previously handled by Rod Taft who was recently transferred to San Francisco as district sales manager. It was also announced that Daniel A. Lundy will continue in charge of western sales of boron products, lithium products and bromine.

•

Safety Conference May 10-11

K. Brantley Watson, vice president, McCormick & Co., Baltimore, will deliver the keynote address at the Governor's Safety-Health Conference and Exhibit May 10-11 at the Lord Baltimore Hotel.

Gov. Theodore R. McKeldin will speak at a banquet May 11. The chemical-fertilizer section of the conference will feature a talk on "Flash Fires in Fertilizer Mixers," which will be given by E. C. Perrine, Nitrogen Div., Allied Chemical & Dye Corp.

•

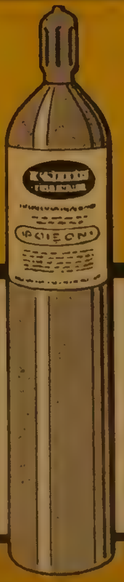
Covington Appointed Manager

J. B. Perry, Jr., general manager, Mississippi Cottonseed Products Co., announced last month the appointment of William Aston Covington as manager of the firm's Hazelhurst Oil Mill and Fertilizer Co., Hazelhurst, Miss.

Atlas Names Malinowski

Atlas Powder Co., Wilmington, Del., announced recently the appointment of Theodore P. Malinowski as development manager in the product development department of its Chemicals Division.

Mr. Malinowski joined Atlas after 10 years' service in the product development department of Monsanto Chemical Co. At Atlas he will be in charge of the exploratory development section.



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- Kills insects, mites and related pests in all stages of their development.
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- Is economical to use.

Kolker Methyl Bromide is packaged in regular one-pound cans with 2% chloropicrin as warning agent, and 125, 150 and 450 pound cylinders of 100% methyl bromide.

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For further information on this highly effective fumigant, please call or write us today.

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panel discussion on phosphates highlights CALIFORNIA FERTILIZER CONFERENCE

SOME three hundred persons attended the fourth annual California Fertilizer Conference on the campus of the University of California at Riverside on April 15-17, under the sponsorship of the Soil Improvement Committee, California Fertilizer Association. Featured at the meeting were two panel discussions, one on salinity problems, and the other on phosphate. The phosphate panel, moderated by H. H. Hawkins, Golden State Plant Food Co., Glendora, consisted of F. T. Bingham, O. E. Lorenz and T. W. Embleton of the University of California and E. Troung, University of Wisconsin.

Oscar Lorenz reported information on phosphate response in vegetable species trials in Imperial Valley; E. Troug spoke on soil as a medium for plant growth, and outlined methods being employed in dealing with acid soil conditions which prevail in Wisconsin; and T. W. Embleton described the fertilizer test plots in northern San Diego county, describing how different fertilizer treatments have resulted in various reactions in orange and avocado plots.

Dr. Logan Carter, California State Polytechnic College, San Luis Obispo, outlined in detail the economic value of correct fertilizer use in dry range production of beef cattle. Dr. G. B. Wood, Oregon State College, Corvallis, Ore., banquet speaker, outlined the current economic situation.

Allen B. Lemmon, chief, California Bureau of Chemistry, Sacramento, presented a review of the desirability and the problems involved in changing the guarantees which the fertilizer industry has been using for many years. Involved will be a change from phosphorus pentoxide (P_2O_5) to elemental phosphorus; and potassium oxide (K_2O) to elemental potassium. The American Association of Fertilizer Control Officials has been surveying the subject to determine the amount of support which the industry and the general public would likely give such a change, and has found evidence of considerable support for the change.

•

New Chilean Nitrate Laws

New laws applicable to the nitrate industry in Chile will enable producers to proceed at once with plans to rehabilitate and expand activities and facilities in that country. The change increases from 25 to 40 per cent the participation of the Chilean government in nitrate profits, but provides a guaranty against a recurrent of "discriminatory" foreign exchange rates which burdened the industry in the past. The announcement was made recently in a statement by Harry F. Guggenheim, chairman of the Anglo-Lautaro Nitrate Corp.

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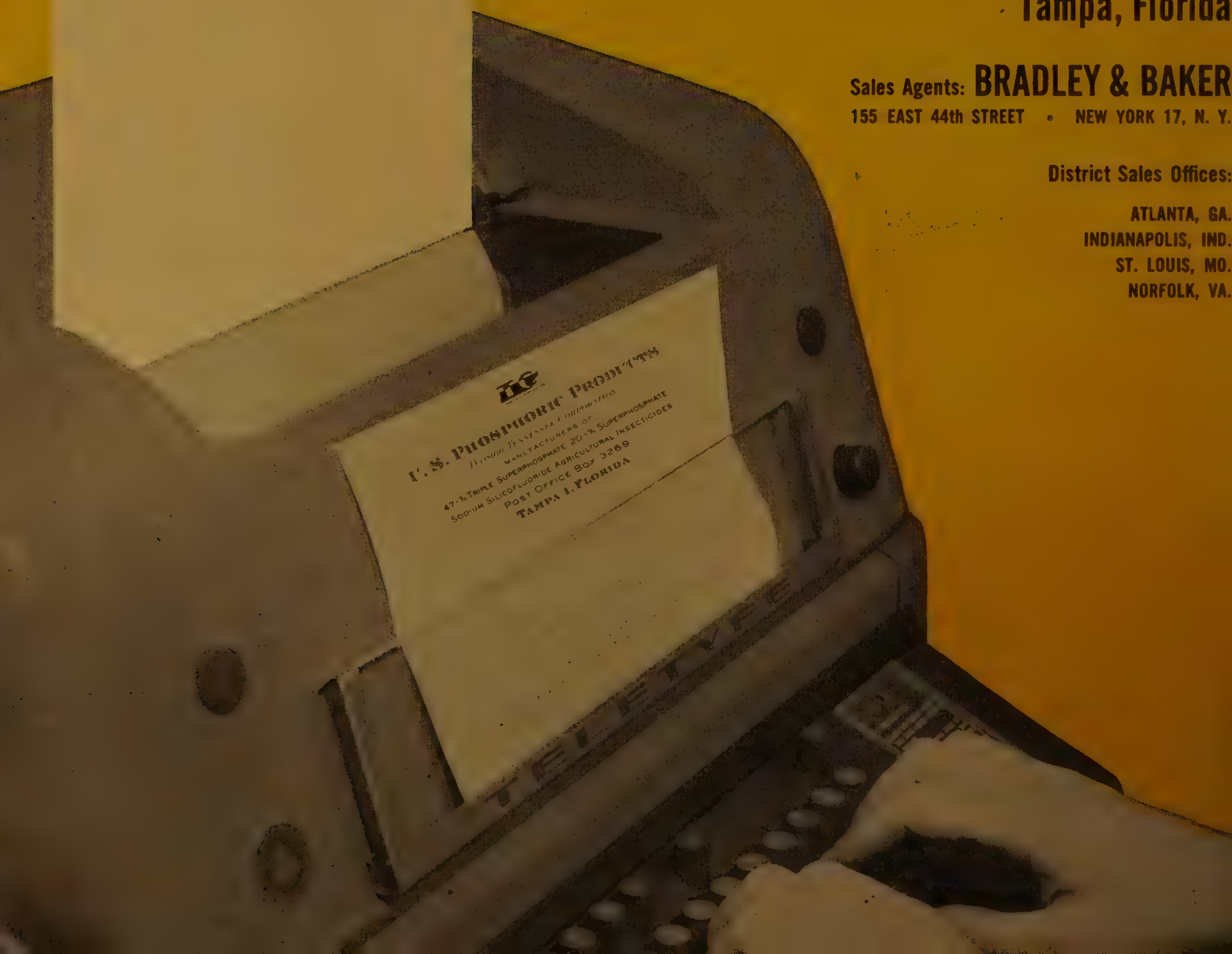
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Virginia-Carolina In Control Contest

A CONTEST for control of Virginia-Carolina Chemical Corp. was brought out into the open late last month when Joseph A. Howell, president of V-C, made public a letter to Rupert T. Zickl who is acting as spokesman for a group which is reported to own 40 to 45% of the common shares of the company. In his letter to Mr. Zickl, who is vice-president of Bartram Bros., 230 Park Ave., a New York holding company, and who figured prominently in the reorganization of the Nickel Plate Railroad, Mr. Howell charged that the Zickl group is forcing "a costly proxy contest upon the stockholders despite every effort made by Management and the Board of Directors to work cooperatively with you for the benefit of all stockholders."

He referred to an ultimatum presented to him by the Zickl group on March 2nd which demanded that five members of the board surrender their positions and be replaced by successors to be named by the Zickl faction. It is his belief, however, he stated, that the stockholders are not prepared to turn control of the company over to the insurgent group. He voiced the feeling that the present board has gone to extremes to work with the Zickl bloc, and denied that any request by them, or by any stockholder, had been refused by the incumbent board.

Pointing out that the present board was elected by V-C stockholders at the most recent annual meeting, Mr. Howell indicated they felt it their "duty and responsibility to protect the interests of all stockholders." He indicated that no action would be taken on the request until the board is given information as to the identity of the group and its purposes in making the request to replace present directors.

"The incumbent Management and Board of Directors," said Mr. Howell, have requested information on this subject repeatedly through at least 12 distinct communications since the March 2 ultimatum. Yet, the full identity, stockholdings and purpose of this group remain undisclosed. No policy changes have been formally proposed or even informally suggested as late as today. They have stated that they do not wish a change of Management, which would appear to indicate no dissatisfaction with operations, but in the face of this failure to give full disclosure of their purposes, they have demanded the resignation of five of the most experienced members of the Board to be replaced by men who have no familiarity either with the Company or the industry.

"It seems right and proper, therefore, that I again ask them to reveal the proposed actions which this group would take if it were in control and the names and holdings of those for whom they claim to speak. Certainly the stockholders have a right to know who it is that propose to take over the Company and why they ask the stockholders' elected representatives to step aside."

Mr. Howell charged in his statement that Mr. Zickl's recommendations as to company policy on various points such as the desirability of recapitalizing seemed to vary with his changing holdings of common or preferred stock. He recalled that only seven days after attending his first board meeting Mr. Zickl began to press the management to dispose of its bag division, and that a month later he discussed sale of the company's rock properties in Tennessee at a price in the neighborhood of only about a million dollars, although the company appraises them at many times that amount.

In response to an inquiry from AGRICULTURAL CHEMICALS, Mr. Zickl characterized the Howell letter as "practically 100% misrepresentation, distortion and half-truths, quotations out of context and even quotations of parts of a sentence, with the remainder not quoted." He indicated that he was not prepared to make any detailed reply, since the Securities Exchange Commission now has jurisdiction over the controversy, and as a matter of fact the SEC has recently invoked a new and stringent set of rules governing such proxy contests. The Zickl group is represented by the law firm of Perkins, Battle & Minor, Charlottesville, Va., who are reported currently to be preparing to ask SEC for permission to form a committee to solicit V-C proxies.

Financial background of the company provides some of the explanation for the current controversy. Virginia-Carolina has never paid dividends on its common stock, and as a matter of fact built up a substantial arrearage on the 6% cumulative preferred stock during the depression years. The arrears reached the figure of $92.50 a share in 1946, Mr. Howell noted in his statement, but during the tenure of the present management has been reduced to a current level of only $73.50.

Net sales of the company in 1955 aggregated approximately $77,500,000 on which a profit of about $2,500,000 was realized. The firm retained $1,100,000 of these earnings to plow back into the business to further its program of diversification.

Under Virginia law a special meeting of the corporation may be called at the request of 10% of the company's stockholders, or failing any such special meeting further action may be anticipated at the V-C annual meeting, September 28th. The threat of the approaching proxy fight may very well indicate action long before the fall date.

■

'57 Agriculture Appropriations

Appearing before the House Hearings on Agriculture Appropriations for 1957, Dr. T. L. Aamodt, Minnesota state entomologist, suggested a stepped-up program to control the gypsy moth and certain other insects. He mentioned that nematode of soybeans is a serious pest in North Carolina, and that it could become much more serious in Minnesota, where soybeans are an important crop. He believes that the government should step into the picture and buy all the land, which is a matter of a few hundred acres, on the spot there," and predicted that unless we do this, we will spend millions of dollars to control this pest.

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Since 1944—when *selective* chemical control of weeds in lawn and crops really began—practically every new development in weed and brush killers has come out of ACP laboratories, the result of ACP research. Our registered name Weedone is perhaps the most famous single name in the whole field of chemical weed control—used the world over.

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WEEDAZOL*

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(aminotriazole)

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Agricultural Chemicals Division

WEEDONE
ACP
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Titlestad Moves Offices

Nicolay Titlestad Corp., New York, chemical engineers, announced that the new location is 521 Fifth Avenue, New York City. The new phone number is OXford 7-5392.

•

Miss. Poisons Act Law

An Act to authorize the feed and fertilizer inspectors of the Mississippi state departments of agriculture and commerce to assist the state plant board in the enforcement of the Mississippi Economic Poisons Act of 1950 was passed recently.

•

Forage Crop Pest Control

When insects feeding on forage crops are abundant, control of these pests gives substantial increases in yield. Connecticut Agricultural Experiment Station records show, for example, that control of the potato leafhopper on alfalfa gave an average increase in yield of 25.3 per cent for the combined second and third cuttings in 1953 and 1954.

Control with insecticides is complicated by the end-use of the crop. Treatments must be made when they will not contaminate the growing crop; or material non-toxic to animals, and subsequently not present in milk, must be used.

Methoxychlor and heptachlor, two of the materials used in the Connecticut spray pests, have been cleared for use on forage crops by the Food and Drug Administration. Other materials are under study, and current information on these will be made available through the Extension Service.

•

Anhydrous Ammonia Output

Anhydrous ammonia production reached a level of 3,163,000 tons in 1955, — 16% ahead of the 1954 rate, according to the March 1956 issue of *Chemical & Rubber*, publication of the U. S. Dept. of Commerce, Washington, D. C. Output of ammonium nitrate also registered a substantial gain in 1955, totalling 1,726,520 tons of fertilizer grade as compared with 1,622,726 tons of fertilizer grade in 1954. Total production of ammonium sulfate in 1955 was 2,100,062 tons, a substantial increase over the 1,751,265 tons produced in 1954.

U. S. exports of solid nitrogenous materials were more than twice as high in 1955 as in the preceding year, totalling approximately 180,000 tons in nitrogen content. Deliveries of domestic potash materials during 1955 reached almost 2,000,000 tons of K_2O, — approximately 5% ahead of 1954 production, according to the American Potash Institute.

Pennsalt Appoints McCoy

Pennsylvania Salt Manufacturing Co., Philadelphia, announced recently the appointment of Dr. George McCoy as manager of the company's Research & Development Department. This is a major division of Pennsalt's recently created Technical Division. Other units of this division which is directed by W. A. La Lande, are the Central Engineering, Patent, Commercial Development and Sales Services Departments.

Vanderbilt puts dusts and sprays in physical condition to kill

For full killing power, your dusts and sprays need the right physical properties — to absorb and disperse the toxicant thoroughly — to make them cling, cover, and stick in doing their deadly work. Vanderbilt carriers, diluents, and dispersing agents are *specially developed* to give dusts and sprays these important physical properties that mean more efficient coverage and increased lethal effectiveness in the field.

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Outstanding dispersing agents. Produce increased toxicant effectiveness through better dispersion of wettable concentrates.

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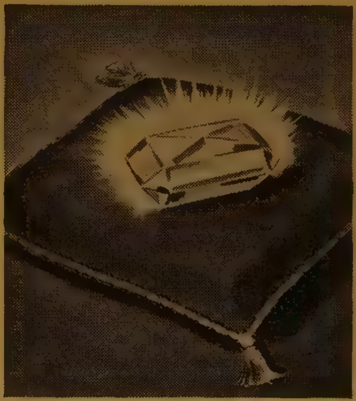

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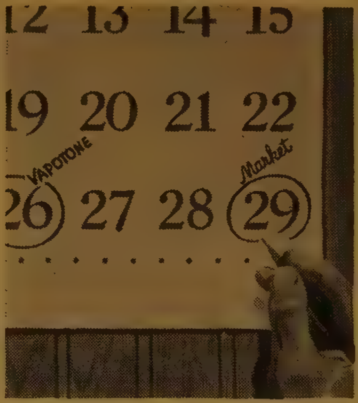

FIRST WITH TEPP (tetraethyl pyrophosphate) dusts for general agricultural use.

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Sign up with an ORTHO program and you're associated with the leader; you get the benefit of *all* the technical background—all the laboratory and field research—and all the formulating skills that have made ORTHO the *number one* line of agricultural chemicals in America today.

You get ALL these values when you buy ORTHO—consistently "fustest with the mostest" in developing agricultural chemicals that have proved to be both effective and economical.

And ORTHO Fieldmen—graduate entomologists and agricultural scientists—can isolate your difficulties and prescribe the quality-controlled ORTHO products to help correct them.

Remember, too, that when you buy the ORTHO program, all the personal, on-your-ground technical advice and services of your ORTHO Fieldman are provided without any extra charge. Get this plus value for yourself. Let the leader lead *you* to better yields and to bigger profits.

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FIRST WITH FOLIAGE OIL SPRAYS—in developing highly refined petroleum oil sprays in new type emulsions and ready mixes.

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Let profit decide your cost

It's right to be price conscious. You're in business to make a profit.

But—don't be misled into buying a cheap chemical, on price alone. Buy a complete ORTHO program! Although an ORTHO program actually costs no more it will return dollars per acre extra profit.

The *complete* ORTHO program helps you do exactly that. First, by *protecting* crops against loss, from planting to harvest. Second, by *promoting* crops to bear a bigger yield of better quality.

Considered profit-wise . . . your ORTHO program becomes a sound investment that pays rich dividends. That's *good management!* We can *prove* it wherever you are, whatever you grow. Dare us!

Borax-US Potash Merger

United States Potash Co., New York announced May 1st that discussions are underway with Borax Consolidated Ltd., London, and its American Division, Pacific Coast Borax Co., to merge with a new American company to be established by Borax Consolidated, Ltd.

It was pointed out that Borax Consolidated Ltd. has for many years held a substantial stock interest in US Potash Co. (at one time 50% of the company's common stock), and was largely responsible for financing the development of the Potash Co.'s mining and refining operations in the early 1930's. Borax is presently engaged in an extensive plant expansion program in the U. S.

Borax announces that the members of the New York financial houses of Lazard Freres & Co., F. Eberstadt & Co. and Lee Higginson Corp., and a representative of the Rockefeller interests have agreed to join the Board of the new American company; that a group of American investors headed by Lazard Freres & Co., will acquire a stock interest of about 8½%; and that provisional arrangements have been made for loans totaling $16 million by an American insurance company and a group of American banks.

•

Farm Program Discussions

"There isn't much that any kind of price support program can do for the farmer" advised Earl L. Butz, assistant secretary of agriculture, before the sixth National Institute of Animal Agriculture, held April 19-20 at Purdue University, Lafayette, Ind., "His crying need (the farmer's)", Mr. Butz continued, "is for an opportunity to expand his production. Few if any agricultural commodity groups have ever expanded after accepting the 'favor' of government high price supports, and the necessary production and marketing controls which follow. On the contrary, the production of many price supported commodities has shrunk in recent years. When the benevolent hand of government is called upon to control prices and direct the flow of goods, opportunity to produce and market is unusually rationed among producers."

Another interesting discussion of the farm program was presented by Ernest P. Baughman, assistant vice president, Federal Reserve Bank, Chicago, whose comments centered on the question of "Can We Export Our Farm Problem." Dr. H. E. DeGraff, Cornell University, questioned "Can We Consume What Agriculture is Geared to Produce?"

Buln on Pesticide Nomenclature

Pamphlets are available on the "American Standard Procedure for Acceptance of an American Standard Common Name for a Pest Control Chemical K62 1-1956." These booklets are available from the American Standards Association, 70 East 45th Street, New York 17, N. Y., at 35 cents a single copy.

The procedures were worked out by a committee of representatives from interested professional societies.

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ABSORBENT CLAY

A SUPER CARRIER

AN OUTSTANDING DILUENT

NOT only will you save on ton prices, but Pike's Peak Clay will help speed up production. Its high degree of absorbency improves grinding and impregnating all toxicants. Pike's Peak's uniformly low moisture and pH of approximately 5 assure you of complete compatibility with a *wide range* of toxicants.

The extremely fine particle sizes provides outstanding flow characteristics before and after impregnation. The standard grind is guaranteed 95% through 325 mesh with a variety of other particle sizes available to meet your specifications.

A trial in your plant will convince you. Write today for complete technical data.

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ALL FROM ONE SOURCE:

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fertilizer nitrogen solutions
sulfuric acid
and soon phosphoric acid

FROM no other single source can the fertilizer manufacturer obtain the particular combination of essential agricultural chemical raw materials to be available soon from the U.S.I. facilities at Tuscola, Ill.

Anhydrous Ammonia and Fertilizer Nitrogen Solutions. The raw materials for this operation are produced on the spot, insuring that supply is steady, reliable and ample.

Sulfuric Acid. U.S.I.'s 400 ton per day sulfuric acid plant produces all grades of virgin acids, including electrolytic and oleum, plus a good quality of process-spent acid suited to fertilizer manufacture. This plant operates year round, permitting U.S.I. to store during off-seasons for the large in-season demand.

Coming Soon — Phosphoric Acid. U.S.I. is building a new plant at Tuscola to produce wet process phosphoric acid from phosphate rock and U.S.I.'s sulfuric acid. The plant is scheduled to go on-stream by the end of 1956. Design capacity will be 30,000 tons of P_2O_5 shipped as 75% phosphoric acid.

Other Agricultural Chemicals. U.S.I. can supply *special* products on a long term basis, if the demand becomes evident. This because facilities are flexible — integrated with all the manufacturing units at Tuscola which produce a wide variety of chemicals.

In the heart of the midwest farm area, U.S.I. provides one flexible source for fertilizer raw materials—a source organized for prompt service.

For further information, address your nearest U.S.I. office, or contact Chemical Sales, U. S. Industrial Chemicals Co., 99 Park Avenue, New York 16, N. Y.

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Chemco Transfers to EBCO

Negotiations for the transfer of Chemical Construction Corp. from American Cyanamid Co. to Electric Bond and Share Co. have proceeded to "an advanced stage," according to announcements by K. C. Towe, president of American Cyanamid and by George Walker, president of Electric Bond.

Chemico will continue to render design, engineering and construction services to Cyanamid and other clients in the chemical industry as an independent but integral part of the Electric Bond and Share organization.

•

NH_3 Plant Explosion

An explosion in the new ammonia plant of Sun Oil Co. at Marcus Hook, Pa., resulted in injury to eight employes and damage estimated at $3,000,000. The explosion is said to have occurred in hydrogen lines leading into a reactor tower. Sun Oil reported that the explosion did not affect any petroleum refining operations.

The unit had been completed early this year at a cost of $10 million, and began production of anhydrous ammonia in February. Capacity of the plant is 300 tons per day.

•

N. A. Cyanamid Program

North American Cyanamid Co., Niagara Falls, Ont., announced recently it will soon begin the initial steps in a major modernization program to improve facilities at its Ingersoll, Ont., quarry. The program will include installation of improved screening and sizing equipment.

•

Pesticide Prod. at New High

Total production of pesticides in the U. S. was at a new record level in 1955 according to a summary in the March 1956 issue of *Chemical & Rubber,* publication of the U. S. Dept. of Commerce, Washington, D. C. Manufacture of DDT set a new record. Total for the year 1955 was 62,053 short tons comparing with 45,535 short tons in 1954. Exports of DDT in 1955 totalled 26,626 short tons, an increase from the 1954 total of 21,163 short tons.

Output of benzene hexachloride during 1955 was 4,978 short tons, an increase from the 4,637 short tons produced in 1954 and a bigger output than in any other year except 1951. Exports of BHC during 1955 totalled 2,116 short tons as compared with 1,143 in 1954. Sales of 2,4-D were also at a record level in 1955.

U. S. exports of pesticides in 1955 were at the highest point in history. Shipments to North American countries were 37% greater than in 1954, with exports to Mexico totalling 62,130,000 lbs. worth $11,145,000. This compares with 39,090,000 lbs. worth $6,325,000 in 1954. It marks the first time that exports to Mexico have exceeded in value those to Canada. Canada took 26,071,000 lbs. of U. S. pesticides in 1955 with a value of $8,514,000.

U. S. exports of pesticides to Europe in 1955 showed a gain of 19% above the 1954 figures. Exports to Africa showed the greatest increase percentage-wise, the gain over the 1954 figure being 58%.

CSC Names Watts Dist. Mgr.

Commercial Solvents Corp. is expanding its marketing and distribution organization for agricultural chemicals in the South. C. J. Watts, Jr., has been named Southeastern District sales manager and will make his headquarters in a new office located at 344 Williams Street, N.W., Atlanta, Ga. Mr. Watts was previously a sales representative for CSC in the South.

The Southeastern District includes Alabama, Georgia, Florida, North Carolina and South Carolina.

•

New Swift Fertilizer Plant

A liquid fertilizer plant will be built by Swift & Co., East of Merced, Cal., providing a land-use permit is approved by Merced County supervisors.

Carl La Vo, field representative for the company in Merced for the past seven years, will be in charge of the plant, which will produce insecticides as well as liquid mixed plant foods.

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The Test Proven
Insecticide Diluent

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Excellent Results

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SUMMIT MINING CORPORATION
BASHORE BUILDING CARLISLE, PENNSYLVANIA

Laboratory Control Essential Feature of Fertilizer Production at FMCI

An all steel building, 240′ x 250′ houses the plant at Fertilizer Manufacturing Coop.

THE manufacture of agricultural chemicals has evolved from a haphazard mixing operation to one requiring careful control in each phase of production. A more critical appraisal of final products, farmer demand for uniformity, together with the introduction of granular and mixed chemicals has made control measures highly essential in the agricultural chemicals manufacturing plant.

The control laboratory, and control board are production aids vital to the operations at Fertilizer Manufacturing Cooperative, Inc., Baltimore, Md. (The story of operations together with schematic diagram and flow plan were described by Albert Spillman in the April issue of *Agricultural Chemicals*, pp. 40-41.)

The manufacturing building at FMCI houses all the mixing and granulation equipment for production of ammoniated granular fertilizer. In the photo above the two story transformer house erected on the SW side of the building houses a 60 cycle 500 hp transformer necessary for operating the granular continuous operation.

The control panel (lower right photo allows for complete control of the entire continuous operation maintaining: uniform heat as needed in the process; starting or stopping the cooler-dryer cyclone fans, combustion air and gas burners.

Any variation in production as it flows from the continuous granulator is readily observed in regular checks on the product in the laboratory. Mr. Spillman advises that the laboratory (lower left photo) is as important as any operation in the granular step. Moisture tests and screen tests at regular intervals keep the plant superintendent advised of the accuracy of the manufacturing operation, and are an indication of whether changes are needed in temperature, moisture, rate of raw material flow, etc.★

A. Spillman (right) and technician check screen analysis in routine laboratory test.

Control panel registering and controlling continuous operation at Fertilizer Manufacturing Coop.

Amendments to Miller Law

SEVERAL amendments to the Food & Drug Administration's regulations for the enforcement of the Miller pesticide residue amendment have been proposed for the purpose of clarifying the regulations now in effect. It was explained that they are not intended to change the FDA's present interpretation or administration of the Miller Law. The general industry outlook is favorable to the proposed amendments, which include some modifications expected to be helpful to the industry.

The complete text of the changes was published in the *Federal Register* April 14th. The NACA sent a copy of this text to all its members, inviting comments to be sent either to the Association or directly to the hearing clerk of the Department of Health, Education, and Welfare.

One of the proposed changes allows "grouping" of various agricultural crops that are considered to be related. For example, apples, crabapples, pears and quinces are considered to be one group of related commodities. Some 27 groups of related crops are listed in a new section to the amendment.

The listing of crops by groups has an important bearing on the fees to be paid for establishing tolerances under the law. Under the amendment, each group of crops is to be counted as a single raw agricultural commodity for the purpose of computing fees.

Another change broadens the definition of pesticide chemicals considered safe to include sodium carbonate and sodium polysulfide. Still another important change is FDA's clarification of its regulations to cover methods of fixing residual tolerance levels of two or more related chemical products on fresh fruits and vegetables.

•

U. S. Potash Names Garrette

U. S. Potash Co., New York announce the appointment of G. Burke Garrette as a southern sales representative. He will work out of the Atlanta office. Mr. Garrette was formerly with American Cyanamid Co.

NOW you can formulate high concentrate wettable powders at low cost with

MICRO-CEL

SUBSTANTIAL FORMULATION SAVINGS

Micro-Cel*, a new line of synthetic calcium silicates, has extremely high absorptive properties. It is this remarkable capacity for absorption that makes it possible to prepare wettable powders with higher concentrations of dry, viscous or liquid poisons. Micro-Cel's absorption also means that more lower cost diluents can be used. Thus high strength formulation costs are now cut to a new low.

REMAINS FREE-FLOWING—MEETS STORAGE TESTS

With Micro-Cel, these high concentrates will remain in a free-flowing state even after prolonged storage. This is particularly important in producing poisons for the export market.

In addition, suspension values after storage of 1.5 to 2.0 I.C.A. have been achieved in 75% DDT wettable powders, based on Micro-Cel. This is more than adequate for storage conditions encountered in most tropical countries.

DEVELOPED BY JOHNS-MANVILLE RESEARCH

Micro-Cel is another development of Johns-Manville Research. Combining high absorption, large surface area, small particle size and excellent dry flowability, it offers a unique combination of properties for insecticide formulation and other process needs.

Sample quantities and carload shipments are now available. Write for further data and sample formulations for poisons of interest to you. Or ask a Celite engineer to help you adapt Micro-Cel to your particular requirements and specifications.

JM

*Micro-Cel® is Johns-Manville's new absorbent-grinding aid designed specifically for the insecticide formulator.

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N. C. ESA Proceedings

The 1956 meeting of the North Central Branch of the Entomological Society of America was held March 28, 29 and 30 at Memorial Union, Purdue University, Lafayette, Indiana. A report covering these meetings will be published as Volume II. Proceedings of the Eleventh Annual Meeting of the North Central Branch, Ray Everly, Department of Entomology, Purdue University, is assembling this report for early publication.

Members who attended the meeting and who appear on the official registration list will receive a copy of the Proceedings at the earliest possible date. Others who were unable to attend the meeting may obtain Proceedings by sending an order or check in the amount of $3.00 to Curtis W. Wingo, 102 Whitten Hall, Columbia, Missouri.

•

Velsicol Names Robert O. Sauer

Dr. Robert O. Sauer, formerly engaged in development engineering work for General Electric at Waterford, N. Y., has been appointed vice president in charge of research and development at Velsicol Chemical Corp., Chicago. At General Electric Dr. Sauer had been manager of engineering and manager of advance and development engineering with the silicone products department.

•

Montrose Stock On Block

Montrose Chemical Co., California, filed a registration statement recently with the Securities and Exchange Commission for 594,320 shares of its $1 par common stock, to be offered publicly, mainly by officers of Montrose. Van Alstyne, Noel & Co. has been named as the principal underwriter.

•

Ga. Marble Appoints Gallagher

The Georgia Marble Co., Tate, Ga. have appointed Dr. Milton Gallagher as director of research and development for the Calcium Products Division. Dr. Gallagher was formerly connected with the Industrial Research Institute of the University of Chattanooga.

$10.5 Million Fertilizer Plant

The Coastal Chemical Corp., a new corporation sponsored by Mississippi Chemical of Yazoo City, Miss., announced plans to build a $10,500,000 high analysis fertilizer plant at Pascagoula. Work is scheduled to begin in August or September, with construction estimated to require some 14 months. The plant will have a capacity of 125,000 tons.

•

Gallowhur W. Coast Agent

Gallowhur Chemical Corp., Ossining, N. Y. advise that Larvacide Products, Inc., is their west coast sales agent and not their exclusive national agent. A mistaken impression was given in a news item in an earlier issue of *Agricultural Chemicals.*

•

S. African Fertilizer Plant

African Explosives and Chemical Industries (Rhodesia) Ltd., South Africa, plan to invest some $9 million in expanding their factory at Rodia, near Salisbury, S. A. The new plant will have an initial capacity for production of superphosphate of some 150,000 tons a year. The project includes plans for both phosphoric acid and sulfuric acid plants. Most of the equipment will be purchased in England.

•

Am Potash Sales Meeting

Members of American Potash & Chemical Corp. sales department attending 1956 sales meeting learn about the manufacture of methyl borate from Ralph Vreeland (left), plant engineer at company's Los Angeles plant. Methyl borate, produced in fractionating column in background, is new boron product being tested as fungicide.

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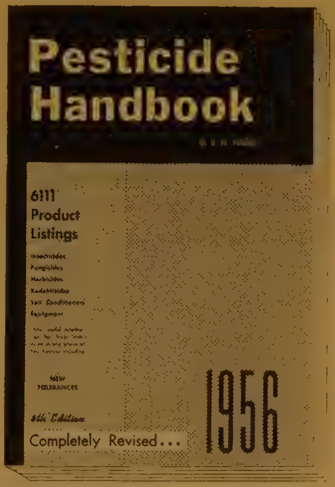

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about the editor—
Dr. Donald E. H. Frear. Editor of PESTICIDE HANDBOOK 1956, is one of the leading authorities on the chemistry of pesticides. He is the author of "Chemistry of Insecticides and Fungicides," the first book dealing with this subject published in the United States. In addition, he has written several other books, including "Chemistry of Insecticides, Fungicides, and Herbicides." Dr. Frear is Professor of Agricultural and Biological Chemistry at The Pennsylvania State University.

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STATE COLLEGE, PENNSYLVANIA

NEWS Brevities

Pennsylvania Industrial Chemical Corp. have announced the establishment of a New England district office in Boston and the appointment of James K. Stevenson as district manager.

AC

Stanley Sales Co., Henderson, Ky., have applied for incorporation in Henderson, Ky. They plan to deal in feed, seed, grain, farm equipment, fertilizer, etc.

AC

Dow Chemical Co., Midland, Mich., advise that they have discovered a new chemical which holds promise as a fly killing insecticide. The material is a complex organic phosphate compound known at present as Dow ET-14.

AC

Joseph Wechsler has joined the organic chemical research staff of Emulsol Chemical Corp., Chicago, a division of Witco Chemical Co.

AC

Rock Valley Fertilizer Co., has filed a charter of incorporation in Delaware, with authorized capital stock listed at $2,000.

AC

Deep Root Fertilizer plant, near Olathe, Kan., went into operation recently. Products from the new plant will be sold in Kansas, Missouri and Iowa.

AC

Stauffer Chemical Co., New York, has announced plans to build a new sulfuric acid plant at Dominquez, Cal., at an approximate cost of two billion dollars. Construction is scheduled to begin next month with full scale production early in 1957.

AC

St. Regis Paper Co., New York, announces that it will commence multiwall bag manufacturing operations at a new plant at Kansas City, Mo., early this summer. The plant is leased from the Southern Development Co. of Kansas City with option to purchase. St. Regis will move into the plant about June 1, 1956.

AC

Albert E. Forster, president, Hercules Powder Co., Wilmington, Del., was elected recently to the post of board chairman. He succeeds Anson H. Nixon, who has retired.

AC

Hayes-Sammons Co., Mission, Tex., manufacturers of Mission Brand agricultural chemicals, announced recently the appointment of Larry E. Franks, Jr., to their staff.

AC

Osterreichische Stickstoffwerke A. G., Austria, produced 570,000 tons of nitro-fertilizer during 1955 and it is expected that this year's production will reach 600,000 tons.

AC

International Paper Co. report plans for immediate construction of a newsprint and bleached kraft board mill near Pine Bluff, Arkansas. It will have an annual capacity of 130,000 tons of newsprint and 165,000 tons of bleached kraft board.

AC

Clark Equipment Co. started operations on the west coast about May 1 in a 40,000-sq. ft. structure in Richmond, Calif. Among operations of the west coast plant will be fabrication and installation of special attachments for fork lift trucks.

AC

Rune E. Swanson has been appointed controller of International Minerals & Chemical Corp., Chicago.

CHEMICALS FOR AGRICULTURE

COPPER SULPHATE

Crystals Powdered
Basic Copper Sulphate

ZEE-N-O

Neutral Zinc 56% Zinc as metallic
The Highest Test Nutritional Zinc

MANGANO

Neutral Manganese 55% Manganese as metallic

W. R. E. ANDREWS SALES, INC.
1505 Race Street, Philadelphia 2, Pa.
Since 1926
Agricultural Chemical Specialists

Olin-Mathieson Chemical Co., St. Louis, has announced plans to open a branch plant in Hutchinson, Kansas.

AC

Coastal Chemical Co., Yazoo City, Miss., has filed a registration statement with the Securities and Exchange Commission covering 399,986 shares of common stock to cover construction and operation of a high analysis water-soluble fertilizer plant.

AC

Hudson Chemical Co., St. Louis, recently purchased a one-story brick building for expansion of its power spray and agricultural divisions.

AC

E. F. Kindsvater of Bartlesville, Okla., was elected president of the Farm Chemical Resources Development Corporation at a recent meeting of the board of directors in Oklahoma City.

AC

C. O. J. Wheeler has been named manager, traffic department of the American Agricultural Chemical Co., New York.

AC

U. S. Steel's Columbia-Geneva steel division anhydrous ammonia plant at the firm's installation at Geneva, Utah, is slated to begin operations late this year, producing some 70,000 tons of high-strength chemical fertilizers annually.

AC

Frederic H. Tunnell, chairman of the board of F. W. Tunnell and Co., Inc., Philadelphia glue and fertilizer firm, died recently in Fort Lauderdale, Fla. He was 70.

AC

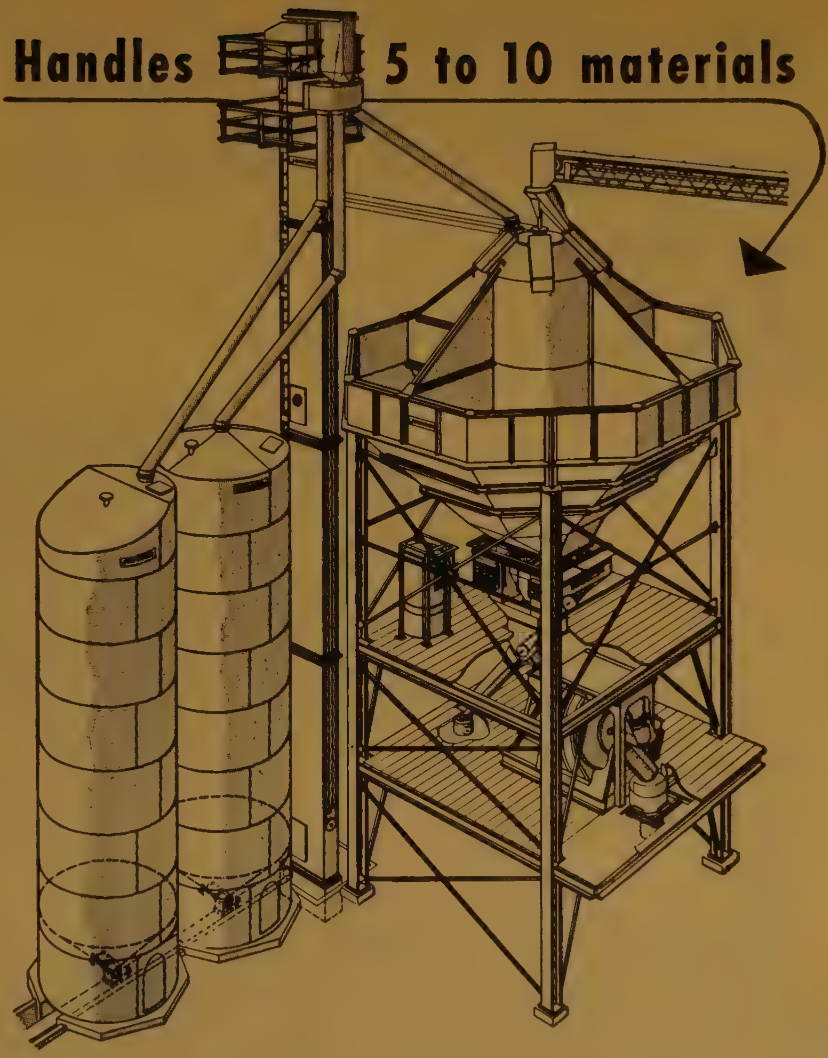
Dow Chemical Co. recently completed a two-year building program at its Texas Division, Freeport, Texas, for research in agriculture.

The facilities will aid original studies on plants and animals in a number of fields including nutrition, disease control, internal and external parasite control and plant physiology.

AC

Thomas E. Deger has been named director of organic research for the Pennsylvania Salt Manufacturing Co., Philadelphia.

Handles 5 to 10 materials



Bin capacity: 150 to 1100 cubic yards

On fertilizer blending operations, multiple ingredients are instantly available with this Johnson Octo-Bin plant. Overhead storage bin has 4 to 8 compartments arranged around a centrally-located tank having 1 or 2 compartments. Tank is charged by chute from bucket elevator. Open bin compartments can be charged by a second elevator or belt conveyor, with pivoted distributor for feeding materials into proper section of bin.

Plant can be arranged with clod-breaker, vibrating screen and collecting hopper for pulverizing and screening materials before they are fed into the bin. Single or multiple material batchers, with manual or automatic controls, accurately weigh materials at high speed, and discharge into mixer for final blending operation. Let us show you how this multiple-material plant can be adapted to meet your specific requirements. Several other types and sizes of Johnson plants and accessory equipment also available.

◀ Fertilizer buckets —

To stockpile, load and unload chemicals, fertilizers, and other fine-grained materials, Johnson brings you a special clamshell bucket. All-welded, smooth inside and out, it loads fast — gives quick, clean dump. Powerful closing action of hard manganese cutting lips prevents load leakage as you hoist and swing the bucket. 10 wide-rehandling sizes: ⅜ to 3 cu. yds. See your Johnson distributor, or write to us.

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J548

5-year average increase from 100 to 200 pounds per acre with MH-30!

Leaf photo courtesy of American Tobacco Co.

Typical case histories of tobacco sucker control

That's right! Many growers got that much added yield of tobacco *plus* savings in labor costs—by using MH-30.

This famous Naugatuck growth regulant eliminates repeated and costly plant-by-plant hand suckering, and increases yield of high quality tobacco.

No longer can suckers sap your finest leaves of needed nutrients. Only one MH-30 spraying by one man is required per season, compared to an average of three hand-suckerings.

Order this extremely safe, reasonably-priced "sucker stopper" today. For descriptive literature and dosage facts write for informational booklet.

Order MH-30 from your local supplier today. Write, wire or phone us if unable to locate source of supply.

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United States Rubber
Naugatuck Chemical Division
Naugatuck, Connecticut

producers of seed protectants, fungicides, miticides, insecticides, growth retardants, herbicides: Spergon, Phygon, Aramite, Synklor, MH, Alanap, Duraset.

Climax Molybdenum Co., New York, will sponsor grants-in-aid at fifteen universities and two independent research foundations for agricultural and biological research on the trace element molybdenum during 1956-1957.

AC

Forest Lane Garden Center, Dallas, recently opened a new garden store featuring nursery stock and lawn supplies. A. C. Johnson is manager.

AC

Robert Velgos has joined the research staff of Michigan Chemical Corp., Saint Louis, Michigan.

AC

Stauffer Chemical Co. has announced that it plans to invest a million dollars in an expansion and modernization of its Niagara Falls, N.Y., plant. About $400,000 of the total new investment will be for additional facilities to manufacture 73% caustic soda. Approximately $150,000 will be spent to increase output of chlorinated solvents.

AC

Escambia Bay Chemical Corp. has announced the appointments of Horace W. Boynton and W. Mayo Smith, Jr., as assistant directors of research. Mr. Boynton will be in charge of engineering and of fertilizer research.

AC

Clemens M. Tomaszewski has been named as (New York) Long Island technical sales representative for the California Spray-Chemical Corp.

AC

Antara Chemicals, a sales division of General Aniline & Film Corp. has appointed the Denver Fire Clay Co., Denver, as the distributor for its products in Colorado, Wyoming, Montana, Utah, Idaho, New Mexico and Western Texas.

AC

Dr. Mark G. Wiltse recently assumed duties as a field specialist with Dow Chemical Co. for the development of agricultural chemicals in a 14-state eastern area. He will be primarily connected with vegetation and plant growth control projects, developing herbicides, defoliants and dessicants.

Equipment AND BULLETINS

New Plant Food Package

Two new corrugated boxes — a regular slotted shipping box and a shipper-display — are currently being used by Smith-Douglass Co., Inc., Norfolk, Va., to package and display its "Nutro Plant Food Pellets." Both units echo the colors of the primary Nutro package to help create strong product identification.

New Thayer Batching Scale

The Thayer Scale and Engineering Corp., Rockland, Mass., has recently developed a new material feeder designated as Model 700N Batching Scale. The pilot model has recently completed a one year test in a nickel producing plant in handling and discharging nickel oxide ore to reduction furnaces.

Model 700N Batching Scale employs a rotary type feeder charging a gateless tipping type weigh bucket. The weigh bucket is suspended from the Thayer Plate Thayer Scale and a cycle timer controls the automatic charging and discharging of the weigh bucket.

•

Hardinge Spotlights Summit

The history and current operations of Summit Mining Co., Carlisle, Pa., are featured in *Hardinge Highlights,* a publication of Hardinge Co., Inc., York, Pa.

Summit's installation of the Hardinge disc roll mill resulted in the first commercial operation of this mill in the U.S. Hardinge has acquired the rights to the mill from Loesche in Germany, and introduced two new features into the mill not used presently with the Loesche design. They are pneumatic cylinders and a gyrotor air classifier.

Fork Lift Trucks Speed Work

Hundreds of drums of cutting and cooling oil required for machining operations at Packard Motor Car Co.'s Utica, Mich. plant, are being handled daily by use of "slotted" forks attached to fork lift trucks manufactured by Towmotor Corp., Cleveland. The usefulness of the trucks has been employed in engine plant material handling and operations have been speeded up 30 to 40 per cent.

•

New Bag Closing Heads

Union Special Machine Co., Chicago, announces the development of a new class of bag closing machine sewing heads—*Class 53600.*

These new units are complete and direct replacements for the older *Class 14500* machines and are designed for closing light to heavy weight cotton, burlap, and osnaburg bags, and one- to three-ply paper bags. All units in the new class are single-needle, high throw machines.

DRYERS AMMONIATORS* GRANULATORS* ELEVATORS COOLERS CONVEYORS *for the Fertilizer Industry*

CONTINUOUS COMBINATION AMMONIATOR-GRANULATOR
One complete unit does the work of two. No need for individual ammoniator and separate granulator. Costs less . . . saves space . . . reduces operating expenses.

DEHYDRO-MAT DRYERS (*patented*) AND COOLERS (*pat. pending*)
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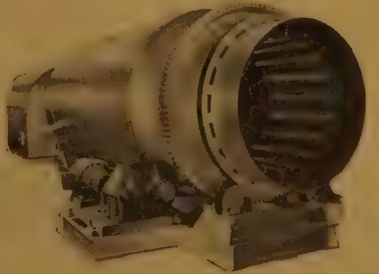

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- Products Liability Manual
- Herbicide Law Manual
- Food and Drug Manual
- Legislative Manual
- Law Guide
- 17 Periodic Bulletins

NATIONAL AGRICULTURAL CHEMICALS ASSOCIATION

Suites 603-604 Associations Building
1145 19th Street, N. W., Washington 6, D. C.

New High-Lift Clark Truck

A lifting height of 51½ through 70½ inches, a downheight of 6½ or 10½ inches and quick accessibility for maintenance are features of a new 4000 lb. capacity battery powered hand truck available in two models. It's the latest addition to the "Powerworker" line manufactured by the industrial truck division of Clark Equipment Co., Battle Creek, Mich.

Named the "Hi-Lift Platform," the truck travels at 3 m.p.h. empty and 2.2 m.p.h. fully loaded, in both forward and reverse. Full-load lifting speed is 9 feet per minute and lowering speed is 20 feet per minute. Lowering speed is hydraulically adjusted to weight carried. A built-in pressure relief valve automatically protects the hydraulic system against excessive pressures.

•

Booklet On Ethers And Oxides

A 64-page booklet, "Ethers and Oxides" has just been issued by Carbide and Carbon Chemical Co., a Division of Union Carbide and Carbon Corp.

The book discusses the applications of thirty-two products including ethylene oxide and propylene oxide. It gives data on physical properties, solubilities, shipping, specifications and test methods, and constant boiling mixtures. Thirty-four physical property charts are also included. An important feature of the new book is a list of literature and patent references for individual compounds giving additional sources for more detailed information.

•

United Offers Safety Bulletin

United Chemical Co., Richmond, Cal., has issued a small folder containing information and a list of approved safety equipment. The wallet sized folder lists equipment, the manufacturer and distributor.

•

Speedometer Shows NH_3 Flow

Instrument Div., Stewart-Warner Corp., Chicago, announced last month a farm speedometer which is said to coordinate over-the-ground speed of farm equipment with the flow of anhydrous ammonia to secure uniform distribution of fertilizer. The speedometer may be installed on either a tractor or rig and registers the actual speed and total distance travelled regardless of varying tire sizes, gear ratios, slippage and other factors.

•

New Bemis Reinforced Bag

A new sewn multiwall paper shipping sack featuring reinforced end construction has been announced by Bemis Bro. Bag Co. The reinforcement, Bemis advises, consists of strips of kraft paper between plies at the bag's top and bottom, giving the effect of an extra ply at the points where most sewn multiwall bag breakage occurs.

The new bags, called "Strength-end" by the company, have been undergoing extensive test shipments for several months with a variety of products, including flour, cement, potash, salt and fertilizer.

"Package Unit" Plants

"Package Unit" liquid fertilizer mixing plants are offered by Butler Manufacturing Co., Kansas City, Mo. Each unit includes mixing equipment, aqua conversion system, and storage facilities. The new type plants may be obtained as turnkey installations, or as ready-to-install units. Each plant, according to Butler, will be able to process 10 to 15 tons per hour, depending on the grade of fertilizer.

•

Nitro Div. Offers "N-Dure"

A new urea-formaldehyde solution to aid fertilizer manufacturers produce granular-type fertilizers containing organic nitrogen for lawns, gardens, and specialty crops is announced by Nitrogen Division, Allied Chemical & Dye Corp. The new solution, called "N-dure," contains 12% nitrogen. It is in production at the Nitrogen Division, South Point Ohio, plant.

JEFFERSON LAKE
Bright Canary Yellow
CRUDE SULPHUR
99.5% MINIMUM PURITY
Produced by our
3 MINES IN TEXAS and LOUISIANA
and our
SULPHUR RECOVERY PLANT - MANDERSON, WYOMING
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Carload Shipments
MOLTEN - FLAKED - LUMP

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NEW ORLEANS, LOUISIANA

UNITED-Heckathorn

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CHEMICAL COMPANY

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AND COMPANY

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Richmond, California

Complete agricultural chemicals service, both domestic and export; custom grinding, formulating, packaging.

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with an 80 year reputation for reliability in quality, price and delivery.

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MURIATE
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New Armour Emulsifier

A new chemical developed specifically for emulsification of pentachlorophenol in water is announced by the Chemical Division, Armour and Co., Chicago. The dark red liquid is a cationic surface active agent called Emulsifier 1990-A, useful with herbicide, defoliant and soil toxicant. It is recommended for control of weeds and grasses in agricultural and industrial applications and may be used as a soil toxicant to control termites around wooden structures.

•

Bulletin on Bromofume

A bulletin on Bromofume soil fumigant has been issued by the agricultural chemicals division of Amer. Potash & Chemical Corp., discussing use in controlling nematodes in the growing of truck and field crops. The folder includes information on uses for Bromofume, correct soil preparation, methods of application and recommended dosages.

•

SARATOGA SPITTLEBUG. Describes the insect, lists host trees, and discusses symptoms of damage, life cycle, natural control, indirect control, and chemical control. 1955. 4 p. U. S. Government Printing Office, Washington 5, D. C.

Agri, Chemicals - Future

(From Page 47)

have? First of all: "What is Crag Herbicide-1?" Second: "Why should I use it?" Advertising must show that the user saves money and time, and grows better peanuts. It must explain where the product can be obtained and who is his nearest dealer — It should ask for an order. Literature must also teach how to use. The farmer is going to have to calibrate a tractor-drawn sprayer and must be told how. He needs to know when and under what conditions he can use the product and he should be told what he can do wrong. Hardest of all, since we all like to talk and our ads show it, is keeping copy concise — you can't hammer home a million points in an eighth page advertisement.

Advertisements are only a small part of a good publicity program. We have a responsibility for informing the county agents, extension specialists, and experiment station workers. Having them informed is half the battle. Technical information sheets must be prepared especially for their use. Some of our sales literature should be directed to them and all should be available to them.

The announcement of a new agricultural chemical is "news" and a news release or a series of them should be planned. What does the new pesticide do? What are the new production facilities? Publicity from "news items" of this sort has proved to be exceedingly valuable. The appearance of informative and well-written articles, preferably by independent experts, in farm journals is invaluable. Of course, all these activities really pave the way for a technically trained salesman. Without him on the spot to render technical service and ask for the order, advertising and publicity are largely wasted.

I have covered a number of development steps in merchandising. Each of these steps is costly and each requires that a profit be earned to repay the investment made. I should like to add my voice to that of John Gillis, who last year gave an excellent speech to this group entitled "Disorder Out of Chaos." We cannot build a sound business on unsound distribution. We cannot render the service we must to the farmer, spend millions of dollars getting a new pesticide ready for market, unless we can show our management a way of getting a return on their investment.

The agricultural chemical industry will grow from teen-age into responsible maturity only if we realistically analyze our markets, intelligently develop each new chemical, pursue a vigorous advertising and publicity campaign, merchandise in an orderly manner, and sell vigorously and honestly. Unless we do these five things, our teen-ager, whom we have nurtured so long and at such a cost, will not even approach its full po-

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EMJEO (80/82% Magnesium Sulphate) Calcined Brucite (fertilizer grade) 65% MgO

POTNIT

(95% Nitrate of Potash)
for
Special Mixtures and Soluble Fertilizers
Other Fertilizer Materials

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Fine for Fertilizer

There's another reason why Koppers Ammonium Sulphate is fine for fertilizer. It is high in nitrogen content; in fact, the nitrogen content is guaranteed to be not less than 20.5%.

Shipment

From St. Paul, Minn. and Kearny, N. J., Koppers Ammonium Sulphate is shipped in 100 lb. and 200 lb. bags—also in box cars and trucks. From Granite City, Ill. and Midland, Pa., it is shipped only in box cars and trucks.

Dependable Source

Koppers is a dependable source of supply for ammonium sulphate. Get in touch with us concerning your requirements. Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pennsylvania.

KOPPERS

**KOPPERS
COAL
CHEMICALS**

M·S·A . . . everything for protection against today's farm chemicals

RESPIRATORS

M.S.A. FARM SPRAY RESPIRATOR

The *one* Respirator that protects against Parathion, EPN, Dieldrin, Aldrin, TEPP, HETP, OMPA, and Systox. This extra protection is the result of accepted new-type filters, which are interchangeable with in-use Farm Spray Respirators. Light weight; comfortable. Accepted by the U. S. Interdepartmental Committee on Pest Control. Write for details.

M.S.A. DUSTFOE RESPIRATOR

Ideal for breathing protection in fertilizer manufacturing. Sturdy; light weight; tops in worker acceptance. Effective filtering action against dusts not significantly more toxic than lead. Write for details.

GAS MASKS

M.S.A. GREENHOUSE MASK (GMC-1)—Safeguard against Parathion, HETP, TEPP, and other organic phosphates.

M.S.A. HYDROCYANIC ACID FUMIGANT MASK (GMK)—For use in heavy concentrations of hydrocyanic acid gases.

M.S.A. ORGANIC FUMIGANT MASK (GMA)—Protection against Methyl Bromide, etc.

M.S.A. ANHYDROUS AMMONIA MASK (GMD)—Safeguard against ammonia vapors. All masks are accepted by U. S. Interdepartmental Committee on Pest Control. Write for details.

PROTECTIVE CLOTHING GOGGLES—FIRST AID

Complete line of protective clothing from suits to hoods. Also goggles, faceshields, and first aid material including the M.S.A. Anhydrous Ammonia Kit.

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tential. If we do fulfill these requirements, proper advantage can be taken of the results of industrial research and the years ahead will bring the final realization of present hopes.★★

THE LIME FACTOR

(*From Page* 123)

quality forage. Properly inoculated such an alfalfa crop will fix nitrogen from the air to a value of $15 to $30 per acre per year.

Liming can be spread in bulk and the job can be done at almost any stage in the crop rotation, but generally it is best to lime 6 to 12 months in advance of a legume seeding. Newly spread lime should be mixed with the whole plow layer. If the acidity requires more than 3 tons of lime to the acre the recommendation is to disk one half the amount into the soil before plowing and the other half after plowing. If the amount to apply is up to 2 tons per acre for alfalfa and nurse crop seeding, the entire amount is broadcast and disked in after plowing.

To be a Grade A agricultural limestone, the material should have at least 50% of its particles pass through a 60-mesh sieve and have a neutralizing value of at least 85 percent. One should know what quality he is buying. Specifications for standard ground limestone vary among the states and each fieldman should acquaint himself with those prevailing in his own sales territory.★★

WASHINGTON REPORT

(*From Page* 71)

several months or beyond a year, will be compiled and discussed with other Central and South American countries.

* * *

C. H. Bachelder, entomologist, U. S. Department of Agriculture, stationed at the Turrialba Experiment Station, believes that American manufacturers have a bright future in Central and South America. He warns, however, that conditions in Central America and the United States are vastly different and that success depends on an understanding and appreciation of these differences and the ability to meet them.

For instance, he cites the long period in the United States during which only a few insecticides were used. He believes that this conditioned farmers and the public for the influx of materials developed since the war. Latin America, he says, has not had this period of conditioning, consequently there is a great need for detailed information on the usage of agricultural chemicals, particularly on the timing and dosage as well as toxicity to the applicator and potential residue hazards.

Bachelder says he's heard many reports where the application of pesticide has been too late for effective control. Lack of proper information on the timing of application reflects on the reputation of all pesticides. He further emphasizes that sales should be attempted only where the pesticides are completely adapted to the crops, the people, and the application equipment available. One foreign company recently created a series of most unfortunate circumstances by shipping material into Costa Rica which did not follow the recommendations just listed. These experiences may retard the development of agricultural chemicals in Costa Rica.

With the exception of large scale cotton production and a few other situations, the equipment used more often to apply pesticides is the small hand type of miniature motorized equipment. Here the big problem is spare parts, with the slow deliveries presenting serious problems.

From a number of conversations I had with agricultural leaders in Costa Rica it seems to me that controls based on the Miller Amendment eventually will be adopted in most Latin American countries. Even now there's a feeling on the part of some scientists that whatever recommendations are made officially should be in compliance with existing decisions made on the Miller Amendment in the United States. Consequently it

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All Steel Self-Contained Fertilizer Mixing and Bagging Units
Complete Granulating Plants
Batch Mixers—Dry Batching
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Dust Weigh Hoppers
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Fine Dusting Clays

"Barnet Clay"

A NON-ABRASIVE clay mined under our personal supervision at Aiken, S. C. Available in carloads and truckloads; packed in 50 lb. de-aired bags.

"Perry Clay"

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Complete up-to-date news of the agricultural insecticide and fertilizer industry are reported monthly in AGRICULTURAL CHEMICALS. Regular features and columns keep you informed of technical and trade news. Enter your subscription now.

AGRICULTURAL CHEMICALS

BOX 31 CALDWELL, N. J.

is well to consider that every decision made in the United States directly affects the thinking and recommendations of many agricultural leaders in Latin America.

At present many Latin American countries have no control, either over the advertising, the labels, the contents, or recommendations for usage. Consequently there is abundant opportunity for fraud.

As to how much the pesticide market may expand in Latin America, most predictions I heard are that business will either double or quadruple in the next five years.

* * *

The mid-May closing date for submitting opinions on the Food and Drug Administration's proposed changes in procedure comes at a time when the pesticide use season actually begins. The several proposals made by the Food & Drug Administration basically formalize the practices being followed by the Agency on an informal basis. It should be added that, for the most part, the proposals made by the Agency have the support of the agricultural chemicals industry.

One of the key proposals calls for the grouping of like crops for consideration by Food and Drug officials as well as industry researchers. It calls for the lumping together of citrus crops for example. This proposal should save time and money on the part of both industry and the government, and at the same time should not detract from the effective carrying out of the Miller Amendment. Other proposals add sodium carbonate and sodium polysulfide to the list of chemicals regarded as safe. A final proposal calls for the clarification of regulations on allowable tolerances of mixed residues.

* * *

Aldrin and dieldrin are now among the chemicals with famous "zero tolerances" for some of their uses. The significance of a zero tolerance was discussed rather thoroughly in this column last month. Certainly the more chemicals which receive this tolerance, the more important it becomes for all agricultural workers as well as industry scientists to understand the significance of zero so they can properly interpret this tolerance.

On an objective basis, and with no regard for any chemicals named herein, a zero tolerance may indicate extreme toxicity. On the other hand a zero tolerance may indicate that the chemical has properties such that when it is used in accordance with directions it should leave no measurable residue on agricultural crops at the time of harvest. Remember that the Food and Drug Administration's policy is not to permit any residue on an agricultural crop unless it is absolutely necessary. So a tolerance of zero can mean that the chemical is relatively harmless, or that it simply dissipates between the time of application and normal harvest.

Because of the interpretation which can be placed upon a tolerance of zero it might be well for all those involved to make special effort to assure understanding of the tolerance as it applies to their particular chemicals.

Scientists at the Agricultural Experiment Stations have many complex problems to deal with and it would be little short of a miracle for them to thoroughly evaluate all the complexities of the tolerances issued by the Food & Drug Administration. Since the law itself lists four specific definitions of "zero tolerances" it's little wonder that there's some head scratching. Education is probably the best answer.

* * *

Congratulations to Mr. Albert H. Moseman, Director of Crops Research, Agricultural Research Service, U. S. Department of Agriculture, slated to head the agricultural programs for the Rockefeller Foundation beginning July 1. Mr. Moseman has many friends in the pesticide industry who wish him well in his new and important work. His contributions to agricultural progress in the U. S. D. A. have won him respect throughout agricultural and business circles.

* * *

Dr. Gotthold Stiener, Chief, Nemotology Division, U. S. Depart-

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ment of Agriculture, is scheduled to retire May 1. Dr. Stiener is considered one of the national authorities in this field and his numerous discoveries have provided a solid foundation for future progress.

RYANIA

(From Page 51)

Sugarcane Borer in 1947. *Jour. Econ. Ent.* 41(6): 914-18.

(4) Ingram, J. W., and E. K. Bynum. 1950. Comparison of Ryania and Cryolite for Control of the Sugarcane Borer in Louisiana. *Sugar Bulletin* 28 (12): 181, 189.

(5) Spencer and Meade. 1952. *Cane Sugar Handbook* 8th Ed. p. 614.

DEFOLIANT

(From Page 34)

gallons of diesel fuel by tractor or in 3 to 5 gallons by airplane. This form of Defoliant 713 is also more economical to ship and store.

Conclusions

PHILLIPS Defoliant 713 performs as well as any commercial defoliant under normal conditions. Under normal weather and plant growth conditions it usually equals or exceeds the results obtained with any other material.

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Defoliant 713 gives the good feature of a desiccant along with a high rate of defoliation.★★

Literature Cited

1. Proceedings of Eighth Annual Beltwide Cotton Defoliation Conference, National Cotton Council, Memphis, Tennessee.
2. Proceedings of Ninth Annual Beltwide Cotton Defoliation Conference, National Cotton Council, Memphis, Tennessee.

STREPTOMYCIN

(From Page 73)

days after being sprayed. Most of them recovered promptly. However, celery, radish, and lettuce were slow to recover from the 1:25 spray. The radish plants were still stunted and somewhat chlorotic 1 month after application of the spray. Celery showed stunting and chlorosis for about 20 days, after which it regained its green color but the sprayed leaves remained rugose.

Although there were slight differences among the three plants of one vegetable sprayed with one of the streptomycin concentrations, they were not nearly so great as the differences caused by variation in concentration.★★

FUMARIN

(From Page 31)

their toxicity and be acceptable to rodents after 9 months storage at room temperatures.

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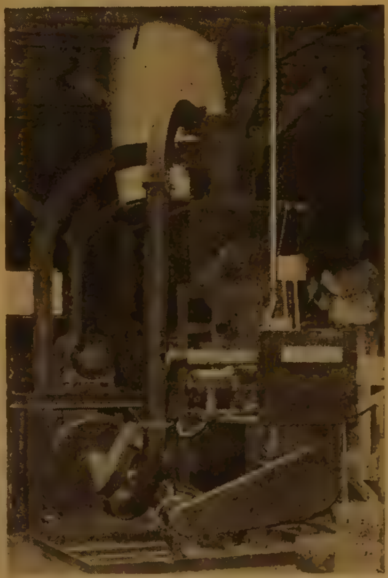

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Tale Ends

AN internal contest for control of Virginia-Carolina Chemical Corp. was brought out into the open last month when Joseph A. Howell, president of the company, made public a letter to Rupert T. Zickl, who heads a group which Mr. Howell believes is trying to get control of Virginia-Carolina. Mr. Howell charges that in spite of the fact that present management and the board have tried to work cooperatively with the Zickl group for the benefit of the stockholders, a proxy contest is being forced upon the company.

The Zickl group presented an ultimatum to the V-C board March 2nd, demanding that five incumbent members resign to allow the new group to take control of the company. This request the management has refused, and in turn has asked the Zickl group to answer questions as to their total stock holdings, the identity of members of the group and the changes in management policies which they propose to put into effect. (For further details see Pg. 103).

Strike Two!

WHEN they've got you two strikes down, it's sort of hard to take your best cut. And when you're a salesman out calling on the trade, and they don't remember your company, and never heard of its product, they really have two strikes on you.

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1956 marks the fiftieth anniversary of the first Federal Food, Drug and Cosmetic Law. The Association of Food and Drug Officials of the United States has named a special 50th Anniversary Committee to stimulate the interest of industry groups and others in celebrating the event. Two important dates for such celebrations have already been set: the week of May 6th, when the Association of Food & Drug Officials of the United States will hold its 60th annual conference; and June 7th, when the 50th anniversary will be celebrated at the Mayflower Hotel, in Washington.

AC

Donald L. Miller, who handles the publicity chores for NAC, authored an article, "For Beauty and Safety", which ran in the February issue of "Highway Highlights." He points out that particularly on the new high-speed toll roads use of herbicides is absolutely essential from the safety angle. He also refers to the use of fungicides, soil insecticides and growth regulators to help make our highways scenic as well as safe.

AC

An NAC Florida convention always involves presenting a trophy to the owner of the winning dog in some Canine Kentucky Derby. Here Bill Allen makes the supreme sacrifice. The Greyhound looks like he has just finished off the mechanical rabbit, and would be happy to start in on any handy limb. Didja have him? It was a $95.00 quinella.

AC

More fish in farm ponds through fertilizer use. This is the theme of a recent release by the Virginia Wildlife Research Unit at VPI. Dr. J. S. Lindsey, director of the Unit, points out that a farm fish pond will produce six to eight times as many fish if it is fertilized. A fertilized one acre pond, he says, should produce 300 to 400 lbs. of fish per year.

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